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FREUD AND EDUCATION (I)

by G. H. BANTOCK

Reader in Education, University of Leicester

PART I

IN this paper, I shall be particularly concerned with the implications of Freud's views on the nature of the child and on the function of the teacher; and I shall want to refer briefly to the relevance of these views to "progressive" theory. At the same time, it should be realised that Freud himself made few overt comments on education and his notions about childhood were in the main theoretically formulated in order to explain certain phenomena noted in the history, reconstructed during the analytic session, of adult patients. They were not derived from much first-hand experience of child therapy or from experimental observation of child behaviour. Childhood, then, to Freud, is a theoretical construct, formulated to "explain" adult behaviour and based on adult memories. Nevertheless the observations of subsequent child therapists would seem to have confirmed a good deal of what Freud thus reconstructed; at least, the construct would appear to be clinically applicable.

Although psychology and philosophy, formerly not differentiated in the writings of philosophers, split asunder, and psychology, in the nineteenth century, acquired the tentative status of a separate discipline, it has nevertheless remained clear that a psychology rests ultimately on an ontology, a metaphysic of man. Freud, indeed, implicitly recognises this by calling *his* psychology a "meta-psychology", thus implying a speculative as well as an empirical element.

For Freud, man was an animal, and nothing more than an animal. Such a view was based partly on empirical grounds, partly on metaphysical. His early researches in the field of neurology led him to conclude that the nervous system of the higher animals did not contain elements different *in kind* from those of the lower animals, but only different in degree. He was influenced in his early days by Darwinian evolutionary views; and he later attempted to demonstrate the evolutionary pattern in the development of the ego out of the "impersonal primordial group of impulses he designated as the Id", as Ernest Jones puts it. The metaphysical implications of his theory of man emerge in his denial of any religious or supernatural element in man's development: "The development of man up to now", he asserted in *Beyond the Pleasure Principle*, "does not seem to me to need any explanation differing from that of animal development." Hence, as Ernest Jones says, "The world of nature seemed all-embracing and he could find no evidence of anything outside it."

This conception of man was further reinforced by an influence especially noticeable in the first tentative exposition of his metapsychological views in the *Project* of 1895. Here, as James Strachey pointed out, he seems to have derived much from Helmholtz's school of physiology, according to which neurophysiology and consequently psychology were governed exclusively by chemico-physical laws. The law of constancy was the fundamental principle—a mechanistic one—in terms of which Freud conceived the working of the whole psychic apparatus; according to this the nervous system strove to keep the pitch of excitation to which it was subjected at a constant level.

A consequence of considering man exclusively a product of the natural world is that this development comes to be regarded as subject to universally valid scientific laws. Psychic growth, as well as physical, follows a universal pattern, and all men must pass "successfully" (whatever that implies) through a series of well-defined stages in order that they shall achieve maturity or "normality". Particularly is this so in libidinal development, when the individual moves through a series of stages prescribed by heredity. There are, according to Freud, two broad phases of sexual development—that covering the first five or six years and that stemming from puberty—divided by the "latency period". Infantile sexuality manifests itself in the activity of a whole number of component instincts, dependent upon the erotogenic zones of the body. Thus psychic development for Freud, as Ernest Jones puts it in his biography, involves

> . . . a ceaseless search for the endless possible ways in which various fundamental biological drives may achieve satisfaction; and the complicated "reaction-formations" that serve as defences against the ever present dread of these drives in their primitive form.

Freud's theories of instincts (he changed his views) involve a fundamental rejection of that optimistic tradition concerning man's moral nature stemming from the eighteenth century Enlightenment. His hypotheses concerning the sexual and aggressive, destructive instincts led him to two very important formulations. The assumption of natural goodness was dismissed as one of those "unfortunate illusions" which "bring only disaster". Freud, indeed, would have no truck with the notion of human beings as "gentle friendly creatures wishing for love": "*Homo homini lupus*" much more adequately sums up his assessment of the situation. Nor does he regard children as "pure and innocent", except in the sense that their youth renders it necessary to consider them as a-moral. Until contact with reality necessitates "reaction formations" of instinctual strivings, children comprise simply bundles of egocentric, satisfaction-seeking impulses; they "assert their animal nature naively enough and demonstrate persistently that they have yet to learn their purity".

The other feature of Freud's pessimistic assessment of human development involves the stress he laid on the emotional, passional life, in the sense that stability of the rational conscious ego or intellective side was constantly threatened by the irrational, unconscious id, and lived a life of precarious balance. Thus the whole optimism of the rationalistic tradition of the Enlightenment, which looked to the gradual elimination of the "evil" in man's nature through the spread of reason, was called into question:

> Psychoanalysis unhesitatingly ascribes the primacy in mental life to affective processes, and it reveals an unexpected amount of affective disturbance and blinding of the intellect in normal no less than in sick people.
> (*The Claims of Psycho-analysis to Scientific Interest*)

In so far as Freud's therapeutic purpose is resolutely rationalistic, he certainly cannot be termed an irrationalist. Yet his view of the "natural man" is quite different from that, say, of Rousseau. Rousseau assumed that the inherent drive towards self survival ("amour de soi-même"), if carefully watched lest "need" degenerate into "caprice" and "amour de soi-même" become "amour propre", was essentially "good", and moral in the sense that its indulgence would not lead beyond the harmonisation of all with each.

In contradistinction to this view of the Enlightenment, Freud posited the egocentric, instinctual strivings of the primitive ego. His "state of nature" is Hobbesian rather than physiocratic. And yet, "progressive" thinking in education, so profoundly influenced by notions of natural goodness and theories of free inner development untrammelled by obtrusive adult or pedagogic influence, assimilates without difficulty so sombrely based a theory of human development. How this comes about can only be made clear from an analysis of that triad of forces, through the operation of which, in the Freudian scheme, the "natural" becomes "civilised" or "socialised". I refer to the id, the ego and the super-ego.

The id is the seat of the instincts and passions, totally lacking in organisation or moral sense. Its essential characteristic is that of being "foreign to the ego", though it is from the id that the ego gradually differentiates out. The uninhibited indulgence of the id's instinctual strivings would make of social life an impossibility; there are two restraining factors, aspect of the developing psyche, which serve as checks on these instinctual demands. These are the ego and the super-ego. On the face of it, then, the Freudian system would seem to involve an authoritarian regime, necessitating the building up of internal restraints through external pressure of an almost Wesleyan fierceness. The romantic belief in the unrestricted efflorescence of personality as the ethically "right" mode of development, would seem to be repudiated. Freud's is essentially the tragic view of the human situation. Yet an examination of the precise role assigned to the ego and super-ego shows that the Freudian conception of "right" development does not imply a simple restrictive or repressive system. This comes about through the split between "morality" (conscience) and rationality. As Niebuhr puts it, "Freud's science has invalidated the idea of a god-like reason, which can and does impose duty on inclination"; rationalist he may have remained; but the relation of "reason" and "duty" was profoundly altered. Indeed, the ego often needs reinforcement against the peremptory demands of the moral nature; for it stands between the id and the super-ego, and suffers from the encroachments of *both*. The super-ego, which represents the introjection of the parent figures, becomes the seat of conscience and exercises the censorship of morals:

> As the child was once compelled to obey its parents, so the ego submits to the categorical imperative pronounced by its super-ego.
> (*The Ego and the Id*)

Now it is true that the super-ego has a job of great importance in "civilising" individuals:

> Civilisation therefore obtains the mastery over the dangerous love of aggression in individuals by enfeebling it and disarming it and setting up an institution within their minds to keep watch over it, like a garrison in a conquered city. (*Civilisation and its Discontents*)

From the renunciation enforced by the super-ego, guilt develops; and as pain is an essential if unpleasant necessity for the continuance of bodily existence, so guilt is essential for the survival of social life.

But there exists an optimum degree of restrictive power at the disposal of the super-ego which avoids, on the one hand, the moral anarchy which would result from too little development and on the other the crippling of psychic life which springs from its overstimulation. Freud discovered that man could be *too* moral; too great stricture could be crippling.

The excoriations of conscience are, of course, a not infrequent subject for novelists; a major theme in Henry James, for example, involves refinements of moral awareness leading to renunciation. But though James was aware, particularly towards the latter part of his career, of the conflicts between renunciation and the injunction to "live", his fine moral perceptiveness, in his greatest work, approved the renunciation of an Isabel Archer or a Fleda Vetch. His near contemporary Freud, only thirteen years his junior, moves nearer, in the name of hedonism, to a tempered indulgence. The super-ego in fact, has two faults:

> . . . in commanding and prohibiting with such severity it troubles too little about the happiness of the ego, and it fails to take into account sufficiently the difficulties in the way of obeying it—the strength of instinctual cravings in the id and the hardships of external environment.
>
> (*Civilisation and its Discontents*)

The hair shirt, then, is no longer a sign of a superior morality, but the mark of an over-repressive conscience. "Mental health" demands its abandonment. The instinctual strivings demand a degree of recognition.

Thus Freud's attitude to the moral agency in man is equivocal. He admits that the "strengthening of the super-ego is a highly valuable psychological possession for culture". But, at the same time, as a result of his clinical experience, he urges that "in our therapy we often find ourselves obliged to do battle with the super-ego and work to moderate its demands". Renunciation itself may stimulate the super-ego, because though renunciation of gratification has taken place, the wish persists and cannot be hidden from the super-ego: "every renunciation becomes a dynamic fount of conscience".

One cannot help noting, in Freud's own attitude and in its repercussions, a certain moral coarsening. Of course, in saying this, one must step lightly. Undoubtedly the puritan conscience in certain of its manifestations can be an unpleasing thing, and in some cases a crippling one. Obsessive acts can, undoubtedly, spring from an overstimulated conscience, and Freud's remarks must be understood in relation to his clinical experience. At the same time, my reference to Henry James above was not fortuitous; it was a preparatory means of indicating as a sort of "touchstone" a degree of moral refinement, displayed by James in his novels and stories, which Freud nowhere reveals. Indications of a comparative moral obtuseness emerge from Freud's references to literature and religion. His comments on religion in *The Future of an Illusion* are often depressingly naive; and it is a shock to read, in Lecture 23 of the *Introductory Lectures*, of the artist as "one who is urged on by instinctual needs which are too clamorous: he loves to attain to honour, power, riches, fame, and the love of woman". Such a notion is basically vulgar; and it is vulgar because of a lack of moral insight into the nature of the true artist's integrity. Such a judgment is made the more perplexing when one considers Freud's own genuine interest in and admiration of literature.

Freud, too, sometimes speaks as if the "real" personality is manifested only in the cruder instinctual strivings. For example, in his *Introductory Lectures* he tells of a young man's relation to his father—one of outward piety, involving tender ministrations during the father's protracted illness but, if a dream analysis is to be believed, masking an unconscious antagonism. Freud comments on the latter state of affairs:

> I have no doubt that this was, *in reality*, his attitude towards his father during the protracted illness and that his ostentatious assertions of filial piety were designed to divert his mind from any recollections of the sort. (my italics)

Such a diagnosis involves a moral crudening of the whole situation, a reduction to a lower moral level. He once asserted: "The Unconscious is the true psychical reality". Thus, the psychically "real" tends to be equated with those primitive strivings, those crude instinctual urges which it is the function of civilisation largely to control and repress. I believe that this tendency to equate the true psychic "reality" with the primitive rather than with the "moral" self has been profoundly influential in our era, especially in its literature. It has induced a whole new school of "realist" writers, especially in America, to prefer passion and the exploitation of crude behaviour to the examination of moral sensibility. There is, of course, another side to Freud; but there is no doubt but that he was mightily fascinated by the id: and in this our age has followed him all too readily.

In thus drawing attention to this lack of moral refinement in

Freud's outlook, this lack of a certain sensibility, I in no way mean to detract from the immense genius of his achievement; after all, the sorts of dilemmas inherent in psychoanalytic treatment are often —though not always—of a comparatively crude type; and, indeed, one can see that a certain obtuseness of moral sensibility, a certain lack of delicacy would be an essential prerequisite for anyone, particularly at that time, who was proposing to visit those dark nights of the soul revealed during analytic treatment. The coarsening process is an inevitable concomitant of the immense positive achievement of therapy. Moreover, one can see that a lack of involvement is a necessary element in a therapeutic situation. Scientific detachment in human relations necessarily exacts a certain price. And in defence of Freud, one can easily detect the total ineffectiveness of a Henry James as a practising analyst. Nevertheless, this relative obtuseness of Freud —if granted—has important repercussions.

For one detects in Freud the acceptance, as norm, of a comparatively crude conception of "l'homme moyen sensuel". The images he uses are not without their significance in this respect:

> Our mind . . . is no peacefully self-contained unity. It is rather to be compared to a modern State in which a mob, eager for enjoyment and destruction, has to be held down forcibly by a prudent superior class. (*Collected Papers*. Vol. 5)

In view of the image of "the mob", it is not surprising to find that in Freud, love often seems to be a matter of instinctual libidinous desire and not a matter of the totally engaged sensibilities; the notion is of a conflict between vulgar desire and inherently superior reason, not of their mutual interaction and emergence as what Wordsworth calls the "feeling intellect"(2). Again, the phenomenon of tenderness is not one that Freud much refers to. The mechanistic model of psychic change referred to above, involving "discharge" of excitations according to the law of constancy, reveals, perhaps, a source of his crudity. The norm, for Freud, is not one of living at the height of the moment, sensitivities totally and reciprocally engaged, but a state of equilibrium, of neutrality in hard separateness from "harsh" reality—significant epithet, as we shall see. The pleasure-seeking instinctual urges display no capacity for altruism or self-transcendence, but achieve only discharge or repression. For Freud man stands over against "reality" like a sullen animal kept at bay by a big stick. Even the repressed, in the unconscious, is never forgotten but remains ever ready to express its bitterness and resentment.

Along with this goes a somewhat equivocal attitude to "civilisation". His view of the civilised life is, in the main, materialistic, despite a not insincere obeisance in the direction of "beauty". At the same time, he often talks as if he realises the vital importance of instinctual renunciation, through repression or sublimation, as a means to social life; such renunciations become "the source . . . of the grandest cultural achievements, which are brought to birth by ever greater sublimation of the components of the sexual instinct". Nor is this an isolated reference to the benefits and achievements of civilisation. One of the difficulties, however, of interpreting Freud, with his immense output of written papers, and books, lies in the fact that he often expresses conflicting opinions. Thus, he is capable of saying categorically:

> . . . we have found it impossible to give our support to conventional sexual morality or to approve highly of the means by which society attempts to arrange the practical problems of sexuality in life. (*Introductory Lectures*)

And again:

> It need not be said that a culture which leaves unsatisfied and drives to rebelliousness so large a number of its members neither has the prospect of continued existence, nor deserves it. (*Future of an Illusion*)

Here, one begins to sense the equivocal part played by Freud's hedonism—a hedonism which, as we have noted, expresses itself as an absence of stimulation rather than as a positive state of euphoria, as an itch to be got rid of rather than a creative thing. Although well aware that some degree of renunciation is an essential prerequisite to any form of life in society, he seems only partially convinced that the achievements of civilisation are worth the dessication (as he considers it) involved. Whereas in his picture of man, he is in sharp opposition to the rationalistic optimism of his age, in this he is much more at one with it. Since happiness replaced salvation as the commonly accepted goal, any form of asceticism or any restrictions on the expression of self other than in purely social terms have seemed irrelevant at best and perverse at worst. Hence Freud's unease at the fact of renunciation, despite his awareness of the daemonic force of instinctual demand. One senses, in the background of the Freudian ethic, the modern assumption that fullness of life has a quantitative—Freud would have called it an "economic"—connotation, not a qualitative. One could put it another way by saying that much of the experience of, say, Eliot's *Four Quartets*, would seem strange to him despite the austerity of his own life.

Freud's analysis of the ego reinforces our dissatisfaction. The ego brings the influence of the external world to bear upon the id and tries to substitute the reality-principle for the pleasure-principle. It represents "what we call reason and sanity". One of its main characteristics is its weakness, a weakness implied in the similes Freud uses in referring to it:

> The ego's position is like that of a constitutional monarch, without whose sanction no law can be passed but who hesitates long before imposing a veto on any measure put forward by parliament. (*The Ego and the Id*)

Hence

> Its position mid-way between the id and reality tempts it only too often to become sycophantic, opportunist and false, like a politician who sees the truth but wants to keep his place in popular favour. (*The Ego and the Id*)

It is little wonder, then, that Freud emphasises the importance of the affective life in psychic development. The ego appears weak and uncertain in its behaviour, its control all too easily upset by the peremptory demands of the id, or crushed by the hyper-moral demands of the super-ego.

Yet it is at the strengthening of the ego that the therapeutic process aims. It is, as I have noted above, a quite fundamental mistake to think of Freud as an irrationalist. He realised the strength of the irrational side of man's nature, and the precarious nature of his conquest of the passional id. But the aim of therapy was to replace the "consequences of repression by rational mental effort". He described it as "reclamation work, like the draining of the Zuyder Zee", its object being

> to strengthen the ego, to make it more independent of the super-ego, to widen its field of vision, and so to extend its organisation that it can take over new portions of the id. (*New Introductory Lectures*)

He sums up: "Where id was, there ego shall be." Or, to put it another way, the essence of psychoanalytic therapy is "reality testing".

It is when we ask what "reality" meant to Freud that the dissatisfaction I have referred receives its confirmation. Lionel Trilling has, to some extent, drawn attention to these unsatisfactory features in his essay in *The Liberal Imagination* on "Freud and Literature". Trilling admits that what crudeness exists in Freud's conception of "reality" no doubt in part stems from the comparative crudeness of the analytic situation. As the unrealities of neurotic patients are often of a not very subtle kind, therapy is "aimed not at theoretical refinement but at practical effectiveness. The polar extremes are practical reality and neurotic illusion". Yet, he continues, the

" 'reality' inherent in Freud's therapeutic purpose is one that is wholly 'given', something quite fixed and static, not something that is essentially, in the Coleridgean phrase, the product of a coalescence of subject and object", or, in the word of Dewey's that Trilling quotes, one that is "taken". This is largely, one conjectures, because Freud's world of reality is one based on purely scientific criteria: "Scientific work is our only way to the knowledge of external reality". For the aim of science is

> to arrive at correspondence with reality, that is to say with what exists outside us and independently of us, and, as experience has taught us, is decisive for the fulfilment or frustration of our desires. (*New Introductory Lectures*)

Thus it is not surprising to find Freud assuming that part of the function of the ego is to afford a "picture" of reality somewhat in the passive mode of a camera, in order to persuade the id to avoid a suicidal demand for complete satisfaction in face of superior external forces:

> In the fulfilment of this function, the ego has to observe the external world and preserve a true picture of it in the memory traces left by its perceptions, and by means of the reality-test, it has to eliminate any element in this picture of the external world which is a contribution from internal sources of excitation.

In other words, the ego is purely passive in perception; it simply presents to the straining and impatient id a true image of the "reality" it has to face in seeking satisfaction; it *accepts* stimuli and only then does it actively react.

> The relation of the ego to the outer world is passive in so far as it receives stimuli from it, active when it reacts to these. Its instincts compel it to a quite special degree of activity towards the outside world, so that, . . . we might say that the ego-subject is passive in respect of external stimuli, active in virtue of its own instincts. (*Instincts and their Vicissitudes*)

Furthermore, this "reality", is always looked upon as "harsh", as I have noted above. So, of course, it must have seemed to many of Freud's patients. But Freud's work has a connotation outside the clinical relationship of therapist and patient and so the implications of his words must be considered. The world is, for Freud, never a thing of joyous acceptance.

Hence Freud's curiously ambivalent attitude to art and literature. For all his admiration and respect for the artist, in the last analysis Freud thought of him as the provider of substitute gratifications. Art provides compensation—or at most therapy—rather than a means of apprehending features of the "real" world through the exacting use of certain media. In this way, art becomes a matter of relaxation rather than an incredibly difficult mode of apprehension leading to a profounder appreciation of the external world. Art, Freud said, "does not seek to be anything else but an illusion." At best, the artist occupies "the intermediate territory between the wish-denying reality and the wish-fulfilling world of phantasy".

NOTES

1. This article is based on a paper given at one of the Colloquia at the University of Bristol Institute of Education, Nov. 1958.
2. The tradition of thought referred to here has just been well analysed by Professor Walsh in his book *The Use of Imagination*.

THE TEACHING OF ARITHMETIC

by W. FLEMMING
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PART II : THE CHANGED OUTLOOK

In mathematics there is one thing only of primary importance, that a teacher should make an honest attempt to understand the subject he teaches as well as he can, and should expound the truth to his pupils to the limit of their patience and capacity. G. H. HARDY, 1925

1. INTRODUCTION

THE initial acceptance of arithmetic into a school curriculum dominated by the classics was compelled by utilitarian pressures arising in part from the growing need for cyphering in business. Computation received undue emphasis and arithmetic was taught as an end in itself, as a subject separate and distinct from mathematics, in accordance with the needs and outlooks of the day. Arithmetic is more than a tool subject, however. It is the start and foundation of all mathematics, and so to regard arithmetic provides the only acceptable basis for its teaching in this modern world. The recently published Ministry of Education pamphlet, *Teaching Mathematics in Secondary Schools*, in its chapter dealing with first (primary) stages, expressly states, "We are mainly concerned with the mathematical steps which the children must take" and that "the Mathematics that children learn in the Primary School should not be confined to arithmetic. The simple properties of Geometry, Algebra and Mechanics, provide suitable material (1)." The current need for mathematicians strongly reinforces this point of view and is a significant event in the history of the teaching of arithmetic.

"Arithmetic is the most useful of all the Sciences (2)." This is a fact which is not likely to be overlooked; but arithmetic is also a mathematical structure. "Mathematical truths always have two sides or aspects. With the one, they face and have contact with the world of outer realities lying in time and space. With the other, they face and have relations with one another. . . . Our purpose in teaching mathematics in school should be to enable the pupil to realise, at least in an elementary way, this two-fold significance of mathematical progress. A person, to be really 'educated', should have been taught the importance of mathematics as an instrument of material conquest and of social organisation and should be able to appreciate the value and significance of an ordered system of mathematical ideas (3)." These familiar words present us with a double objective in the learning and teaching of mathematics, but when they are applied to arithmetic, it is clear that there is a problem to be faced. The pupil aims only at acquiring proficiency in the working of examples. If he succeeds he is satisfied and so is his teacher. The pupil is, no doubt, intuitively aware of the mathematical ideas underlying his practice, for he makes use of them, but he does not seem to reach the stage of their conscious realisation or verbalisation while at school. In fact, he derives his satisfaction from the practice of arithmetic rather than from its theory, and a mature interest in mathematical ideas and structure appears at a later stage of development. The subject must first have been adequately experienced in the setting of mathematics and its study more or less completed, before its growth, form and place in mathematics can be properly observed and appreciated. In practice, the school course seems to have turned out students who are "trained" in arithmetic, but not "educated" in the sense which T. P. Nunn intended.

Our pupils gain arithmetical competence at an early age, when their impression of the subject must be one of technique and computation. For many, this outlook appears to fixate and it may be that long and early familiarity with the subject destroys curiosity. It is seldom realised, either at this stage or later, that the end of the journey in arithmetic may not have been reached and that for its completion a further course of study corresponding to stage C in geometry (4) may be necessary. If this is so, the end point of the school course can hardly be considered a satisfactory starting point for a prospective teacher of the subject. Yet, in many cases, teaching has had to be thus based on incomplete subject knowledge. In consequence, our thinking and teaching have tended to centre on computation, with the attendant risk of its over-emphasis. If the time for a fundamental review of the teaching of arithmetic has arrived, as has been suggested, perhaps we should look more closely at the subject and the ends of its teaching. With this in mind, it is proposed to examine the content of school arithmetic with particular reference to the growth and extension of the number concept in order to illustrate abstraction, generalisation and symbolisation in mathematics—major features of mathematical thinking.

2. THE CONCEPT OF NUMBER

Tobias Dantzig writes,

> If we are to judge of the development of our own remote ancestors by the mental state of contemporary tribes, we cannot escape the conclusion that the beginnings were extremely modest. A rudimentary number sense, not greater in scope than that possessed by birds, was the nucleus from which the number concept grew. And there is little doubt that, left to this direct number perception, man would have advanced no further in the art of reckoning than the birds did. But through a series of remarkable circumstances man has learned to aid his exceedingly limited perception of number by an artifice which was destined to exert a tremendous influence on his future life. This artifice is counting, and it is to counting that we owe the extraordinary progress which we have made in expressing our universe in terms of number (5).

Apparently the number perception of our primitive ancestors did not extend beyond the recognition of "one", "two" and "many" and countless ages passed before man had abstracted the generalised notion "two" from collections of pairs of objects. Dantzig reminds us also that we still use such words as couple, brace, pair and twin, each in its own specific context to denote "two" and that "many" similarly finds expression in a variety of ways.

Certain "ineducables" who can indicate the extent of small collections of objects by matching them with appropriate numbers of fingers, may yet be unable to arrive at the general notion of number. They can abstract from particular instances but are incapable of generalisation. It is possible to arrive at a cardinal or group concept of number by a matching process without being able to count, for the latter requires a recognition of order based on the number relationships: one plus one make two, two plus one make three, . . . If a child can perform the motions of counting in relation to a group of articles and cannot answer the question, "There were four birds and two flew away. How many were left?", he may be reaching after number in its naming aspect but he lacks insight into number in its cardinal aspect and his grasp of the number concept is incomplete. When we say that a child has attained the number concept to a particular level we mean that he can more or less perform certain number operations.

Children discover number in ways which are obscure and which, as yet, are little understood. Abstraction, involving selection, grouping and classification, is central in the process of concept formation, categorisation or generalisation, as it is variously described; and a factor which may be termed insight or intuition seems also to be required (6). Piaget's experiments (7) lead him to suggest that, in forming the number concept, a child first discovers principles of conservation: the shape of an object is invariant even though its appearance alters with the angle of vision; the quantity of liquid in a containing vessel is independent of its shape; the "number" of objects in a group is unaffected by dispersal over a wider area. A growing realisation of conservation is considered to take place between the ages of 4 and 6, leading to the formation of the number concept. The process is completed by the child at about the age of 7 when he enters the third of three stages of learning. In this stage, he practises the use of the concept symbol, and integrates the concept with increasing effectiveness into the pattern of his thinking. Whatever may be the steps whereby the child acquires his number knowledge, teachers at least recognise that experience with concrete material provides the key to understanding and they teach accordingly.

3. SYMBOLISATION OF NUMBER

The effect of symbolising number is to cause the concept to be crystallised from the practical sources of its origin, resulting in sharpened awareness of the concept, which becomes clear and precise. The symbols facilitate the use of number in computation and in elementary measurement, the main business of school arithmetic.

The measurement of continuously varying quantities, such as distance, mass and time, by means of numbers, which are separate discrete quantities, is effected by means of the concept of unit which reduces measurement to counting.

Computation becomes possible with the invention of systems of numeration and notation. None of the various systems which existed in antiquity is of much value of itself as a reckoning instrument. Each requires the assistance of some form of calculating aid, as can readily be appreciated in the case of the Roman system by attempting the example MCCCIX ÷ XIX. The abacal methods which were adopted compare favourably in speed and accuracy with methods used to-day. The Hindu-Arabic system of numeration, by virtue of its notation, is its own reckoning instrument. It substitutes pen and paper for the abacus, and constitutes a form of thinking mechanism. The secret of the device is positional numeration and its structure and functioning are explained in terms of place value and zero. The Hindu-Arabic system is the keystone of school arithmetic and the instruction of the child in its technicalities and use falls to the lot of the junior school.

The symbolisation of number has a further outcome which is of central importance in the growth and development of mathematics. The concept itself can function as an object for further abstraction, leading to new concepts of wider generality and applicability. The positive and negative integers come into being in this way but the nature of the progress and the relation of the integers to the natural numbers are matters which are not always well understood. What is the justification for accepting zero as a number? How is a child to be answered who states, "No nothings are nothing, no somethings are nothing. They can't be. No something should be something." What is the distinction between $(+6)$ and 6? Why does $(+2)\times(+3)=(+6)$ What have we in mind when we write that $6\times 7=42$ or that $(-6)\times(-7)=(+42)$? Is (-2) really a number? What is a number?

The application of number to the measurement of quantity creates a need for new types of "numbers" such as fractions. These are capable of concrete representation as are the natural numbers. The rules of operation for natural numbers when applied to fractions enable us to calculate with the latter as if they are in fact numbers and the calculations lead to correct results in practice. We feel able to accept fractions as being numbers in the sense of the natural numbers. Negatives and zero also arise as a result of number applications, in the measurement of temperature, for example. The symbols representing negative quantities can be manipulated according to rules suggested by the natural numbers to give results which are confirmed by experience. Under these circumstances, we inevitably look upon the symbols as representing legitimate forms of number and we are content to use them as such without further question. This intuitive, empirical approach is the one adopted in the teaching, which correctly attempts no more than a stage A treatment (4). It can safely be asserted that most people are thus pragmatically based in their thinking about number. There seems to be no need to discuss the purely mathematical considerations upon which the extension of the number concept depends. Such a discussion may even appear to be unhelpful to the teacher faced with the practical problems of classroom arithmetic. G. Temple writes, "Mathematics is an abstract study, and the history of mathematics is a history of abstraction. But the nature of mathematical abstraction is frequently misunderstood, and hence flow many misconceptions and difficulties for the student (8)." The methods of mathematics and the distinction between mathematics and its applications are matters which do not appear always to be well appreciated and understood. For these reasons, it may be useful briefly to indicate a mathematical approach to the construction of integers from natural numbers.

All computation in arithmetic can be reduced to counting, whereby the successive numbers are arrived at by addition, $1+1=2$, $2+1=3$, $3+1=4$, . . . The operations of addition and multiplication can always be performed within the system and are governed by five simple laws, which the counting process makes evident, and which may be expressed algebraically as follows:

Commutative Laws: (1) $a+b=b+a$ (2) $ab=ba$
Associative Laws: (1) $a+(b+c)=(a+b)+c$ (2) $a(bc)=(ab)c$
Distributive Law: $a(b+c)=ab+ac$

The first two of these, for example, indicate that the result of adding or multiplying two numbers is independent of the order in which we take the numbers. From these laws and the special law, $a \times 1=a$, we can deduce the addition and multiplication tables and establish the addition and multiplication processes in general, as the following examples serve to illustrate:

$$\begin{aligned}
&(1)\ 2+2 = 2+(1+1) = (2+1)+1 = 3+1 = 4\\
&(2)\ 2\times 2 = 2\times(1+1) = 2\times 1+2\times 1 = 2+2 = 4\\
&(3)\ 46+23 = (40+6)+(20+3) = (40+20)+(6+3)\\
&\qquad\qquad = 10(4+2)+(6+3) = 60+9 = 69\\
&(4)\ 46\times 23 = (40+6)23 = 40\times 23+6\times 23\\
&\qquad\qquad = 40(20+3)+6(20\times 3)\\
&\qquad\qquad = 40\times 20+40\times 3+6\times 20+6\times 3\\
&\qquad\qquad = 800+120+120+18 = 1058
\end{aligned}$$

The inverse operations of subtraction and multiplication, unlike their counterparts, cannot always be carried out within the system. There are no numbers corresponding to $(2-2)$ and $(4-6)$ i.e. to 0 and (-2), using an alternative symbolism in which the minus sign is no longer used to denote the operation "subtract". We can usefully play games with these symbols in accordance with the rules of number. If we complete the sequence of the symbols, we arrive at

$$\ldots (-3), (-2), (-1), 0, (+1), (+2), (+3), \ldots$$

which have the advantage over the symbols for natural numbers in that they can be manipulated freely without restriction, according to the rules of subtraction.

We take the bold step of dispensing with the natural number symbols and working with these new symbols instead, in accordance with the rules which govern calculation with the natural numbers. We set up a one-one correspondence between the symbols for the "positive integers" and the natural numbers, and between the respective operations in the two systems. For example, 6 corresponds to $(+6)$ and $2\times 3=6$ to $(+2)\otimes(+3)=(+6)$, using the symbols $\times$ and $\otimes$ to distinguish between the two different operations. We find that the "product" $a\otimes b$ has to be taken positive when a and b are either both positive or both negative, and negative otherwise, which is the familiar rule of signs.

For convenience in practice, we write 6 for $(+6)$ and the new set of symbols can be used instead of the originals with a gain in generality and usefulness. The significant property of the natural numbers for our purposes is not that they can be associated with collections of objects but that they obey certain calculating rules. These we take as the basis for the definition of number in the new sense. The concept of number is thus extended or generalised, enabling us to perform the number operations with wider generality. Whether or no the symbols represent any entities in reality is a mathematically irrelevant consideration to which there can be no answer. Number is, rather, as we choose to use it.

A more formal treatment of the passage from the natural numbers to the positive and negative integers (which corresponds to the stage B of geometry) defines an integer as an ordered pair of natural numbers $[a, b]$ (9). This is taken to be the abstract equivalent of $(a-b)$, to which as yet we attach no meaning when $b>a$. Avoiding the use of the minus sign, "equality", "addition" and "multiplication" are defined as follows:

$$[a, b]\ominus[c, d] \text{ if } a+d=b+c.$$
$$[a, b]\oplus[c, d]=[a+c,\ b+d]$$
$$[a, b]\otimes[c, d]=[ac+bd,\ ad+bc]$$

Eventually we write $(+a)$ for $[a, 0]$ and $(-a)$ for $[0, a]$ and obtain the usual results. The method makes it less easy to introduce intuitive notions into the argument and further illustrates how the original concept provides the stimulus and serves as a model for the setting up of the more refined concept.

The number concept can be progressively extended, of course, to include $\sqrt{-1}$ and other more abstract forms, making new branches of mathematics possible and adding considerably to the scope and power of the subject. As A. N. Whitehead wrote of seventeenth-century mathematics, "Nothing is more impressive than the fact that as mathematics withdrew increasingly into the upper reaches of ever greater extremes of abstract thought, it returned back to earth with a corresponding growth of importance for the analysis of concrete fact (10)."

4. FROM ARITHMETIC TO ALGEBRA

Abstraction and generalisation are thus intrinsic in mathematical thinking. Their pursuit seems a rightful end in the teaching of arithmetic, which, therefore, is to be encouraged in its spontaneous growth and development into algebra whenever the occasion arises with children capable of benefiting thereby. Moreover, children like variety and to introduce notions of algebra can make for added zest and interest in the lessons. It provides opportunities for revising arithmetical ideas in new contexts and guises, enabling understanding to be deepened in ways that are pleasant.

Zero arises inevitably in arithmetic and the notation of negative numbers can be introduced in concrete fashion by means of temperature scales. Since a child must ultimately accept zero as a number if he is to progress mathematically, it seems desirable to familiarise him with the notion as early as is practicable. Some teachers begin counting from zero early in the junior school in reference to practical situations such as mounting stairs. Three is then three more than nought, for example, so that $0+3=3$ and $3+0=3$, the cypher being treated tacitly as representing a number. With the introduction of place value, the cypher indicates an empty column, an absence of number, but it begins to represent a number again as computation proceeds. The child may remain unaware of these subtleties, for the notion of zero as a number is difficult to grasp. In the end, the child may come to understand little more than the manipulation and use of the symbol for zero from habitual practice as he learns ordinary language; in which case he may as well be led to accept it as representing a number sooner as later. Nevertheless, there is more than one approach to the teaching of the number zero. No doubt the teacher will be most successful with the method of his choice, which will differ with children of different abilities.

Generalisation can be further encouraged in the arithmetic lesson by using letters to replace numbers and setting up simple algebraic expressions as $P=4s$ and $A=s^2$ in connexion with squares. The idea of a variable arises in many contexts, for example in considering the different multiplication tables which can be represented as $2x$, $3x$ . . . and graphed.

[illegible] Psych. Research

"For the purposes of education," writes Whitehead, "mathematics consists of the relations of number, the relations of quantity and the relations of space (11)." Arithmetic early involves the recognition of relationships. In ratio, proportion and the unitary method we meet the particular relationship which underlies the whole subject of number and its elementary applications. It forms the basis of calculation in the number tables, for instance, and in such applied problems as interest, costs, percentages, profit and loss. Direct and inverse proportion are not the only relationships possible, however. There is the square law which is illustrated above and which connects time and distance for falling bodies. The inverse square law determines the motion of the planets. The abstract study of relationships in general provides the central theme of algebra where we meet the concept of function, described by G. H. Hardy as the most important idea in the whole range of mathematics.

The value of arithmetic as the concrete introduction to algebra becomes increasingly clear. It is easy to see that a poor start in number may seriously handicap a child in his subsequent study of mathematics, possibly alienating him from the subject altogether.

5. THE CONTENT OF ARITHMETIC

The study of arithmetic can conveniently be divided into three parts for our purposes: pure number, mainly the natural numbers, fractions and zero, but including some irrationals which result from square roots; the application of number in elementary measurement; and the Hindu-Arabic system of numeration as a means of computation. We briefly consider each of these against the background of its teaching.

(a) *Number*

Francis Galton recounts a marketing episode he witnessed while visiting a South African tribe, the Damaras, whose concept of number was still undeveloped. Although the barter equivalent of one sheep was two sticks of tobacco, a vendor was unwilling to accept four sticks of tobacco in return for two sheep. The offer puzzled him and he was observed to "take two of the sticks apart and take a sight over them at one of the sheep he was about to sell. Having satisfied himself that one was honestly paid for, and finding to his surprise that exactly two sticks remained in hand to settle the account for the other sheep, he would be afflicted with doubts; the transaction seemed to him to come too 'pat' to be correct, and he would refer back to the first couple of sticks, and then his mind got hazy and confused, and wandered from one sheep to another, and he broke off the transaction until two sticks were placed in his hand and one sheep driven away, and then the other two sticks given him and the second sheep driven away (12)."

This incident illustrates the futility of attempting to develop a written arithmetic on unformed number concepts. We are told that it would be a mistake to assume that the Damaras were unintelligent. Without the concept of number, they were handicapped in their numerical reasoning to a degree which cannot readily be imagined by one not so situated. As Bruner writes, "It is curiously difficult to recapture pre-conceptual innocence. . . . It is as if the mastery of a conceptual distinction were able to mask the preconceptual memory of the things now distinguished (13)."

Those who have read E. A. Abbotts's entertaining book, *Flatland; a Romance in Many Dimensions*, will remember the difficulty with which "Spacelander" was faced when attempting to convey an impression of three dimensional space to "Flatlander". The latter was in a position similar to that of a man blind from birth in respect of colour. He lacked the experience necessary for understanding. Spacelander's explanations bewildered Flatlander, causing him to feel frustration and, finally, anger. Only by being removed forcibly into space did Flatlander acquire the new concept and the process was painful. "Either this is madness or it is Hell,' shrieked Flatlander. "Neither," calmly replied the Sphere, "It is Knowledge." The effect of Flatlander's new knowledge was to deaden the memory of his preconceptual condition, "The matter is now so clear to me, the nature of real space so palpable, that methinks I could make a child understand it. Permit me to descend and enlighten them." His enthusiasm proved of no avail. His subsequent attempts to communicate his new insights and knowledge, persistent though they were, ended in failure, the reward he received for his efforts being "perpetual imprisonment (14)".

The thought world of an adult differs vastly from that of a child and this makes teaching a difficult art. Educationalists agree that a child learns best inductively, by way of discovery from experience. He must be active in "doing" in his own way. This seems to be better recognised in infant than in junior schools. Each new topic in arithmetic is usually best developed through an introductory experiential stage of a practical nature enabling basic concepts to be grasped. Fractions, for example, are first met at home and in everyday life, particularly in shopping. In school, the child folds, colours, and maybe cuts up, squares, rectangles and circles to deepen his insight into the meaning of fractions and their interrelationships. Such work serves as an introduction to the elementary processes involved in their manipulation. It prepares him, for instance, for the addition of fractions by rule, an abstract process which should first be understood and later worked automatically and mechanically.

On the other hand, the adult operates more or less from a position of full concept attainment. His normal way of teaching is to explain and impart information to a passive recipient, using analytical and deductive methods, an approach which finds its full expression in text-books. It assumes that the learner has reached Piaget's final stage in learning when the acquired concept is used and practised.

The inevitable temptation in teaching is to proceed to this third stage too quickly and to become overdependent on the text-book instead of attending to "the productive side of thinking" as Wertheimer describes it (15). Skill in manipulation can exist independently of sensible thought and can substitute for it. This tends to happen in large classes, where it is difficult to attend individually to children and methods of mass teaching are used. The needs of children can easily be misunderstood. For example, an 11-year-old child attempting to work $5\frac{1}{4} \div \frac{1}{3}$ had mastered the rule but he was puzzled. To help him, the following successive explanations were given in appropriate detail:

Method 1. $5\frac{1}{4} \div \frac{1}{3} = 3 \times 5\frac{1}{4} \div \frac{3}{3} = 3 \times 5\frac{1}{4} \div 1 = 3 \times 5\frac{1}{4}$

(We multiply by the first 3 since we make the divisor three times bigger.)

Method 2. We can take $\frac{1}{3}$ from 5, 15 times; and we can take $\frac{1}{3}$ from $\frac{1}{4}$, $\frac{3}{4}$ of a time for:

(*a*) $\frac{1}{4} \div \frac{1}{3} = \frac{3}{4}$ because $\frac{1}{3} \times \frac{3}{4} = \frac{1}{4}$

(*b*) $\frac{1}{4} \div \frac{1}{3} = \frac{3}{12} \div \frac{4}{12} = 3 \div 4 = \frac{3}{4}$

The point of the child's difficulty had been missed. He wasn't in fact puzzled about the rule. His need was for insight into the concepts basic to dividing a fraction by a fraction and the explanations offered tended to confuse him, and to discourage him from asking further questions. He was later helped, at a perceptual level, by means of rectangles divided into quarters, thirds and twelfths.

Facility in the use of the formula "Area = Length × Breadth" notoriously exists without any corresponding grasp of the concept of area. Moreover, the formula, though easy to operate, has false implications and leads to muddled thinking. Numbers only can be multiplied together, not quantities. A child who would not dream of multiplying pennies by pennies may yet be convinced that inches multiplied by inches give square inches, a misconception which is stubborn in its persistence and difficult to break down. Children are resistant to writing (3×4) square inches instead of $(3''\times4'')$.

In his booklet, "An Emerging Programme of Secondary School Mathematics", where is described the Illinois experiment (16), Max Beberman gives examples of the use of ambiguous language in the classroom which, he claims, is a major cause of failure in mathematics. The language factor, which is closely connected with precision and clarity of thought, appears to be of central importance in the early stages of teaching arithmetic. A child easily confuses "time" and "times", for example. In teaching subtraction, a process which is linked in the child's mind with the idea of making smaller, it can disturb him to phrase a question, "How much more is 7 than 4?" The words "same and "equal" are sometimes used synonymously. Ambiguous statements may be used unwittingly as when one tells a child, maybe in exasperation, to "do to the top what you do to the bottom" in respect of the equivalence of fractions. This rule can fail when applied to $\frac{5}{x}=\frac{?}{x^2}$, giving 25 as the result.

The vocabulary needed for arithmetic, apart from its notation, is extensive for a child to master. He finds it a help to be taught appropriate mental statements for use in working the various processes and the teacher should be specially careful in his own choice of words and language. The first methods learnt by a child frequently "stick". Many adults would work $8+7+6$ mentally as "8 and 7 make 15; 15 and 6 make 21" instead of saying to themselves "8, 15, 21" and arithmetic often thus remains at infant level. The ability to work examples correctly is not an infallible guide to progress in arithmetic and it seems necessary regularly to check the mental processes and the language of the child in order to direct his work effectively.

(*b*) *Applications of Number*

The first reason for teaching arithmetic is its usefulness in business and social life (17) and, generally speaking, number knowledge which cannot be so applied in problem-solving is of potential value only. It is essential to study the subject in as many of its fields of application as possible since transfer of training does not occur automatically. As the work proceeds, children should become interested in pure number and number problems. They can be encouraged in this in many ways, by means of magic squares, for instance, and in connexion with other interesting number series, patterns and puzzles. Variety in teaching helps to create and maintain interest.

The traditional teaching approach in which number and its rules of operation are taught as "mechanical" work and then applied in turn to "problems" has proved ineffective. Current practice more or less reverses this order and number is now approached via its problems as it arose historically, out of man's practical needs. With this method, the child accepts number as an essential part of his experience of living and of his exploration and discovery of the world around. The learning of number in its first stages needs no further justification.

The problems of everyday life differ from those of the text-book in that the former are not usually written down nor is the data provided. In the early stages, problems are often posed orally and are of the type, "John, how much taller are you than Mary?" "John, that tap is dripping; how much water is wasted in a day?" Such practical problems call for less rather than more accuracy, exercising qualities of judgment; whereas those of the text-book may require little more than the disciplined application of rules.

In addition to reading and writing when solving problems, the child is required to analyse and interpret data, to select and organise relevant material and to use appropriate mathematical symbolism. And more than this is required, for as Whitehead wrote,

> The art of reasoning consists in getting hold of the subject at the right end, of seizing on the few general ideas which illuminate the whole, and of persistently marshalling all subsidiary facts round them. Nobody can be a good reasoner unless by constant practice he has realised the importance of getting hold of the big ideas and of hanging on to them like grim death (18).

An evaluation of the importance of problem-solving appears in *Mathematics in General Education* as follows:

> The major rôle of mathematics in developing desirable characteristics of personality lies in the contribution it can make to the growth in the abilities involved in reflective thinking or problem solving . . . the study of mathematics is of educational value because mathematics can be made to throw the problem solving process into sharp relief and so offer opportunity to improve students' thinking in all fields (19).

(c) *The Hindu-Arabic System of Numeration*

To acquire the mastery of the Hindu-Arabic system of numeration is a formidable task for the child to face at a time when writing is laborious and the power of reading and comprehension scarcely developed. The system is a pure artifice. In its learning and understanding, the child can get no help in the world around as he does with number. His initiation into the use and practice of the device is entirely in the hands of the teacher, who must provide any materials necessary for the purpose.

Apparatus aids calculation in that it constitutes a simple form of non-written symbolism which demonstrates the working of the number operations concerned at a tactile concrete level. To work on paper with the system of numeration itself as the calculating instrument is a very different proposition. It is necessary to proceed according to rules as before but without the assistance of any form of concrete representation, and thinking at a more abstract level is required. To attempt to visualise what happens in successive steps helps very little and slows down computation. The child, in effect, is learning a written symbolic language in which is inherent the power to assist numerical thinking. The transition to this from the stage of practical manipulation can only take place slowly and is critical for some children. The earliest written work of the child merely records results obtained by practical methods, which are gradually discarded as insight is gained into the new notion of reckoning. Finally, the child learns to rely on it as his main tool and aid to thinking in computation, by which time he is writing fluently and with comprehension in the language of arithmetic. At first, he may fail to grasp the whole idea of written work, especially if it is introduced to him before he is well grounded in the initial practical stage. The child who is slow to form abstractions needs individual treatment.

Full competence in the use of the Hindu-Arabic system involves memorising the tables and number facts and learning and practising rules and processes. Arithmetical concepts thus become truly grasped and fully operational. This phase in the learning of arithmetic requires effort and concentration and seems laborious to children whose grasp of the subject is already insecure. Moreover, arithmetic imposes its own discipline in that answers to questions can be wholly "right" or wholly "wrong" and ignorance cannot be concealed. This is disconcerting to the unsuccessful and may set up anxiety which inhibits thinking. The maintenance of confidence is essential to progress. Clearly, the pace of the teaching must be adapted to the needs of individual children as far as possible. Examples must be carefully chosen and graded and any necessary remedial work undertaken promptly. The simplification of syllabuses and the reduction in computational demands which are progressively taking place, are lightening the teacher's task in this respect and the early introduction of geometry is helpful in stimulating interest.

It is worth noting that at junior school stage, interest in mathematics and mathematical ideas may prove a better incentive in learning than the usefulness of arithmetic, and that the mental image which the child forms of mathematics should be romantic. Surrounded as we are by the products of modern science and technology, it should not be difficult to rouse the imagination of the child and fire him with enthusiasm for mathematics. Even with his limited experience, he can thrill with admiration at the endeavours and achievements of men of mathematics as he does at feats of physical skill and endurance. In arithmetic, he himself enters the world of mathematics and he is gratified to feel that he is tackling a man-sized job. Whether he aspires to the foothills or to the mountains, he should feel no sense of failure or inadequacy, but respect and confidence in mathematics and its masters. Both teacher and child should enjoy arithmetic and its study should stir in the child the beginnings of a "love" for mathematics.

The teaching of arithmetic as a series of meaningless exercises in manipulation, which commonly occurred during the last century, seems to have engendered a reactive tendency to depreciate the value of mathematical techniques. This is unfortunate for, as has been indicated, number symbols and the techniques of their manipulation belong to the language of mathematics and, used correctly, are instruments of thought. The connection between thought and language is obscure and has been discussed by many writers. It is well known that a born-deaf child makes little intellectual progress unless he is taught the use of language: speech seems to be essential in his learning to think. G. Humphrey states that though language and thought are not identical, yet language plays an enormous part in thinking, that all thinking is permeated by language processes. He suggests that the general relationship of language to thinking is illustrated by the process of generalisation or concept formation and writes, "Generalisation is possible without verbalisation but verbalisation apparently refines and improves the process (20)." Whatever may be the connection between thought and language, they are intimately linked. It behoves the teacher, therefore, to consider carefully what is meant by the statement "Mathematics is a language", and to work out its practical teaching implications. Language is best learnt by use and if the Hindu-Arabic system is practised with the intention of assisting mathematical thinking, the techniques of symbol manipulation assume their place of essential importance but at the same time remain in correct perspective. Skill in manipulation is seen to be of value only in so far as it accompanies and serves the end of mathematical thinking.

Place value is not readily understood by children. It appears in more than one guise when working with different systems of units, one example being afforded by the determination of the area of a rectangle 3′ 1″ long and 2′ 4″ wide, say. The carpenter's rule of thumb method of arriving at the result (multiplying feet by feet, inches by inches and adding on the cross products, i.e. 2×3 sq. ft. + 1×4 sq. in. +3×4 ft. in. +2×1 ft. in. = 6 sq. ft. +4 sq. in. +14 ft. in. = 6 sq. ft. +4 sq. in. +(1 sq. ft. +24 sq. in.) = 7 sq. ft. + 28 sq. in.) can be written as a multiplication sum in the duodecimal scale as follows (21):

$$\begin{array}{r} 31 \\ 24 \\ \hline 620 \\ 104 \\ \hline 724 \end{array}$$

i.e. 7 sq. ft., 2 ft. in., 4 sq. in, giving 7 sq. ft. 28 sq. in.

On account of the importance of place value, an indirect concern of most arithmetic lessons, some junior school teachers introduce the Hindu-Arabic system in scales other than the denary at the level of pure number. Working in the binary scale can be enjoyable. The child regards it as a code and is intrigued by the few symbols and number facts which are required to be known. He learns that to write the number nine as 1,001 does not make it any bigger. Nine remains odd and divisible by three even if denoted by 14 in the quinary scale, for its properties do not depend on the method of its representation. Such work encourages thinking about number at a fundamental level but it can cause less able children to become confused in their ordinary number work. One local teacher, experimenting in this field, finds that though his able ten year-olds can work with different number bases, their attention remains focussed on the base itself, in the same way as a younger child's attention remains fixed on the individual sheep rather than on the number of them. Apparently none of the children has generalised the notion of place value from the separate instances of it. A colleague, in attempting work on number scales with juniors in an experimental new approach to mathematics teaching, uses the neutral terms Blocks, Flats, Longs and Units in association with apparatus similar to the Stern apparatus (22), to denote the various number columns of the Hindu-Arabic system irrespective of the scale in use, i.e. whether the number columns are thousands, hundreds, tens and units or eights, fours, twos and units (23). In this way, place value is in a sense symbolised and attention directed to the generalised concept from the start.

The increasing use of computing machines depending on the binary scale seems to warrant the introduction of scales of notation somewhere into the school syllabus but the wisdom of attempting such work in the junior school is questionable and will be decided by the teacher concerned. Ordinarily, the work probably has little value in improving ordinary computation. On the other hand, a case can be made for the teacher himself studying some examples in scales other than the decimal both for the sake of his mathematical outlook, which subtly influences all his teaching, and to help him to appreciate the difficulty the Hindu-Arabic system presents initially to children.

6. PRINCIPLES OF TEACHING

Improvement in the teaching of mathematics in the past seems to have come about as a result of the collective endeavours and experience of practising teachers using empirical methods. It seems as if it should be possible eventually, from educational theory and from a knowledge of the nature of mathematics and of mathematical thinking, to arrive at a broad overall theory of the teaching of mathematics which could be of value to the teacher in informing and giving direction to his work. It is with this thought in mind and with a desire to raise fundamental issues in respect of the teaching of arithmetic that this study of the subject has been attempted.

It was suggested in the first part of this article that three underlying principles can be discerned in the modern teaching of arithmetic, namely, that it should "train for transfer", that it should aim at developing sound attitudes to the subject, and that it should concern itself with the pupil's growth in the power of mathematical thinking. It seems reasonable to assume that progress in mathematics depends ultimately on the ability to think in that field and that the teacher should constantly keep in mind his pupil's needs in this respect. Moreover, we find in the Mathematical Association report, *The Teaching of Mathematics in Primary Schools*, the following:

> There exists in each human mind the power to recognise order, to distinguish a whole and its part, and to combine wholes to make new and distinct wholes. . . . In counting, for example, a particular number gradually becomes endowed with meaning varying in richness according to the width of experience. Thus "six" becomes known as lying between "seven" and "five", as containing a "three" and a "five", as capable of being combined with another number to become yet a third number, "eight". . . . These are fundamental patterns of mathematical thinking and modern investigation seems to suggest that they are fundamental patterns of all thinking. If this be true, it is perhaps the most forcible reason of all for teaching Mathematics (24).

The nature of thinking, and of mathematical thinking in particular, are matters of practical concern to the teacher of mathematics and more needs to be known of them. Concept formation and the place of language in mathematical thinking have briefly been discussed but further questions arise, for example:

1. Classification is fundamental in thinking. We cannot discuss a table, for instance, without first forming the concept and this involves classification. Does it follow that teachers should acquaint themselves with the language and elementary theory of sets, as is the current view in some circles?

2. The normal tendency in teaching is to explain to the child what he should do and expect him to do it. Should he not rather be led to make his own discoveries? This may necessitate a change in the teacher-pupil relationship and a willingness to wait for insight, for the operation of intuition, an important element in mathematical thinking. F. W. Mitchell contends that mathematical education in the past has tended to overstress the importance of deduction and quotes Poincaré for support: "We need a faculty which makes us see the end from afar and intuition is this faculty. . . . Logic, which alone can give certainty, is the instrument of demonstration; intuition is the instrument of invention."(25) Mathematical thinking implies mathematical creativity; interest is not lacking in a child occupied in discovery, whether the goal be known or unknown. Should not the practical activities of the infant school be continued into the junior school?

3. In view of the central importance in mathematical thinking of abstraction and generalisation, perhaps these should receive more

specific attention in the teaching of mathematics. Should there be more opportunity for the child to handle and use concrete material structured according to the Hindu-Arabic system? Likewise, materials for the formation of elementary concepts in algebra hardly exist in the child's environment. Should not mathematical models be provided for the purposes of abstraction in the early stages of the teaching, at least for less able children, to accompany exercises in manipulation?

It is instructive to note a person's reaction to examples such as the following:

(*a*) $\frac{2}{5} = \frac{26}{65} = \frac{266}{665} = \frac{2666}{6665}$.

(*b*) Three philosophers fell asleep in the hot sun while debating weighty problems. Along came an urchin and painted each of their faces black. A loud noise awakened the philosophers simultaneously whereupon each began to laugh at the others black faces. Presently, one of them stopped laughing for he had deduced that his face must be black. Explain.

Does the person proceed as far as generalisation? If not, is a shortcoming in his mathematical upbringing indicated, which could be remedied, or is the explanation simply that he is not a creative mathematician? If our younger pupils were henceforth to be assessed in mathematics exclusively on their ability to make appropriate abstractions and generalisations, our teaching of mathematics would have to be re-orientated and re-centred. Perhaps we must learn, within the existing system, to teach from this different standpoint before outstanding problems in the learning of the subject disappear.

Added force is given to these arguments by the developments in mathematics which have resulted in new algebras and geometries, of which classical algebra and Euclidean geometry are but particular cases. A new point of view has emerged in the subject, the centre of interest having moved away from techniques of manipulation to structure, and, for the teacher especially, to unifying principles and mathematical thinking.

The days of Ballard seem to be over. It may be that a main value of Cuisenaire and other similar teaching material lies in the fact that its use encourages the teacher to understand his subject. Probably the best contribution which the junior school teacher can make in the present situation is to seek to understand mathematics and its development as far as he has studied these, in order that he may teach arithmetic consistently with its mathematical nature. There is much need for classroom experiment.

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3. Nunn, T. P., *The Teaching of Algebra* (*including Trigonometry*) (Longmans, London, new impression, 1941), pp. 16, 17.
4. The teaching of school geometry usually takes place in three stages, A, B and C. In the first stage, the pupil is given a practical, experimental course intended to familiarise him with some of the basic ideas and facts of geometry. Then follows stage B, the deductive stage in which the notion of proof is introduced and theorems are learnt. Stage C is one of systematisation where the logical sequence of the theorems, built up by a chain of reasoning from a few axioms, is examined and geometry is considered as a mathematical structure. See *The Teaching of Geometry in Schools* (Mathematical Association, 1923), ch. 2.
5. op. cit. p. 5.
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9. See Waismann, F., *Introduction to Mathematical Thinking* (Hafner, 1951), ch. 4.
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17. See Wilson, G. M., *Teaching the New Arithmetic* (McGraw Hill, 1951), ch. 2.
18. Whitehead, A. N., *The Aims of Education and Other Essays*, p. 128.
19. *Mathematics in General Education*, A Report of the Committee on the Function of Mathematics in General Education for the Commission on Secondary School Curriculum (Appleton, 1940), pp. 59, 60.
20. Humphrey, G., *Thinking* (Methuen, 1951), pp. 254, 255.
21. The reader who is unfamiliar with scales of notation may wish for a brief explanation. Man's habit of counting on his fingers apparently led to the adoption of the decimal scale. Had he possessed three fingers on each hand instead of five, he might well have worked in the

scale of six. In this case, he would work in thirty-sixes, sixes and units instead of in hundreds, tens and units, writing his numbers:

1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 15, 20, 21, 22, 23, 24, 25, 30, . . .

Examples of a multiplication and division sum in this system, together with the relevant tables are as follows:

$$\begin{array}{rcl} 1\times 2 &=& 2\\ 2\times 2 &=& 4\\ 3\times 2 &=& 10\\ 4\times 2 &=& 12\\ 5\times 2 &=& 14\\ 10\times 2 &=& 20 \end{array} \qquad \begin{array}{rcl} 1\times 3 &=& 3\\ 2\times 3 &=& 10\\ 3\times 3 &=& 13\\ 4\times 3 &=& 20\\ 5\times 3 &=& 23\\ 10\times 3 &=& 30 \end{array}$$

$$\begin{array}{r} 531\\ 23\\ \hline 15020\\ 2433\\ \hline 21453 \end{array} \qquad \begin{array}{r} 531 \text{ rem. } 11\\ 23\overline{)21464}\\ 203\\ \hline 116\\ 113\\ \hline 34\\ 23\\ \hline 11 \end{array}$$

These sums in the decimal system would be:

$199 \times 15 = 2985$ and $2992 \div 15 = 199$ rem. 7, as may readily be verified.

Dantzig describes a method used by the peasant of Auvergne to multiply together numbers between 5 and 10, enabling him to economise in the learning of his tables. To multiply 7 by 9, say, bend down 2 fingers on one hand and 4 fingers on the other, these being the excess of 7 and 9 respectively over 5 (the number of fingers on one hand). The total number of bent fingers, i.e. $2+4$, gives the tens digit in the answer and the product of the unbent fingers, i.e. 3×1, the units digit. To verify the method, suppose we wish to multiply x by y. The result would be obtained as

$$10(x-5) + (y-5) + (10-x)(10-y)$$

which simplifies to xy. The method is capable of generalisation. It would clearly apply if our peasant possessed only three fingers on each hand provided he worked in the scale of six.

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25. op. cit. p. 41-42. See also Hadamard, J., *The Psychology of Invention in the Mathematical Field* (Dover Publications, 1954), ch. viii. "Different Kinds of Mathematical Minds." The book contains an interesting section on thought and language.

FIFTH-YEAR COURSES IN BIRMINGHAM'S MODERN SCHOOLS (I)

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1. SOCIAL BACKGROUND

ONE of the most interesting and significant of recent developments in the city's secondary modern schools has been the introduction of "fifth-year" or "extended" courses. Though the idea may be an old one, such courses have only become an important feature of our non-selective secondary schools since the last war.

The popularity of the courses is the result of the concurrence of two tendencies in our society. One is the tendency of the non-selective secondary schools to produce "tops"—small groups of children who stay on voluntarily beyond the minimum school-leaving age, perhaps in order to pass a specific examination. These must have begun in a very small way almost as soon as the schools were established; but until recently they were limited to a few middle-class children and a small "earnest minority" from the working class.

The other trend is the increasing demand for educational certificates by employers, professional associations and others, as minimum qualifications for entry to certain occupations. Admission to the medical profession has long been conditional on the possession of a degree in medicine; and similarly appropriate qualifications are necessary to obtain a permanent teaching post. But it is only since the war that educational certificates have come to be at all widely demanded as minimum qualifications for entry to apprenticeships. It has been realised that the craftsman, like the technologist and the technician, needs to acquire a good deal of technical knowledge; and day-release schemes have been widely established to try to give him this. But since apprentices, and particularly those on day-release, are expensive to the employer, he will try to ensure a good return on his investment by selecting, where possible, boys who have reached a minimum educational standard. This minimum he defines, *faute de mieux*, as the possession of certain educational certificates. This is not to say that all, or even most, employers would put proven ability before good character. The point is rather that it is becoming necessary for would-be apprentices to "capitalise" native ability in the form of educational certificates. And so the modern school boy with a technical qualification has much more chance of "learning a trade" than the boy with none. To a lesser extent, educational certificates are an asset to the secondary modern school girl.

These considerations arise from my study during the past two years of fifth-year courses in Birmingham, and their effect on the schools. It was possible to interview all but one of the Heads who had had such a course since 1955-56, and seven others who had no course at that time. They were all sympathetic and helpful, and most generous in the time they gave me. I am very grateful to them, and to Mr E. L. Russell, the Chief Education Officer, who supplied me with some most useful information on various aspects of the courses.

The difficulties with which Birmingham has had to contend since the war, especially the shortage of teachers, are well known; in the circumstances, the establishment of the courses was no mean tribute to the courage of all concerned, and gives some indication of the strength of the social pressures favouring them.

2. ORGANISATION

The first half of this report describes those aspects of the courses which caught my attention as a sociologist: the importance of the examinations for which pupils were prepared; the alleged cramping effect of the examinations; the integration of the courses with the work lower down the school; their rate of growth; the procedure for entering them; and the problem of maintaining the morale of those who stayed on.

In 1957-58, all the five boys' schools were offering technical courses; the three mixed schools offered technical and commercial courses; while, of the six girls' schools, five offered commercial courses, two offered pre-nursing, and two offered domestic science and needlecraft courses (2). Eleven of the 14 were preparing pupils for the G.C.E., sometimes in commercial, domestic or technical subjects only; perhaps half of these could be described as having G.C.E. courses; the others intended to have them in the future. Several schools were hoping to introduce a special maturation course. This apparently narrow choice of courses, which had to some extent been imposed on the schools by parents, was the result of choosing to offer courses biased towards a particular social level rather than towards a particular industry.

All the courses had an external examination, generally of regional or national standing, at the end. For the G.C.E., ambitions varied greatly. There might be just one or two children preparing for the Cookery and English Language examinations; or 40 13-year-olds preparing to enter for at least six subjects each. Most Heads felt that, in an area where just over 20% (3) entered grammar or technical schools, the G.C.E. was only for a few of their pupils. The R.S.A. shorthand and typing examinations, at the Elementary and Intermediate levels, were used by all but one of the girls' and mixed schools; and most also made use of Pitman's examinations or those of the Union of Educational Institutions (U.E.I.). Among the boys, the U.E.I. Introductory Technical examinations, at both the A and B levels, were used by almost all schools. Some had recently changed to, or added, the U.E.I. Secondary Schools' Certificate; but there was some hesitation about this, as the certificate had not yet been accepted by the technical colleges. Finally, there was a local examination run by three of the schools and sponsored by the local authority.

The writer did not inquire whether such a range of examinations meant that the fifth year was being used by the children largely to gain as many certificates as possible. But he did ask whether the Heads thought that their schools were being cramped by offering courses leading to several external examinations. About half thought that the examinations were not at all cramping; a quarter were non-committal; and a quarter thought that in some ways they were cramping. Most Heads had minimised the risk of this by entering the children for examinations which were not too difficult, and by keeping the courses largely "end-on" to the rest of the school.

This last point deserves a little more attention. When it advocated the establishment of the courses, the City Council's Secondary Education Sub-committee had suggested that they should gradually become five-year, rather than fifth-year, courses. But in fact most Heads had largely resisted any pressure to allow the fifth-year work and its vocational content to spread further down the school. About half said that none of the first four years was devoted to vocational subjects. Heads were asked, too, whether those who would be staying on were separated from those who would be leaving at the earliest opportunity. The former were usually gathered into the A stream in the fourth year, or put into a separate form; but usually this did not mean that they would be doing very different work. Only one-third of the Heads thought that late transfer into a non-G.C.E. course would be difficult for a child.

A most conspicuous feature of the courses has been their growth. Since the official inception of the courses in 1954-55 with less than 100 pupils, the numbers have roughly doubled each year, and reached 1,188 in 1958-59. In this same period, the number of schools officially recognised as offering courses rose from 13 to 37, which is more than one in three of the city's secondary modern schools. In the most successful ones, over 40% of the age-group were staying for a fifth-year course. With staff none too plentiful, some Heads were wondering how long their courses would remain manageable in size.

We turn now to the selection and transfer procedure. Except for the two-year pre-nursing courses, selection was minimal; the general feeling was that any child who wished to stay on should be accommodated. The Head's rôle could best be described as recruiting; it appeared to consist of persuading parents and children that it was in the child's interest to stay on. This reluctance to select led to problems: less able children would sometimes ask to enter a course, although it was hard to see what benefit they would derive. But, in the words of one Head, "you cannot pour water on C and D children who want to stay, the first time they have shown any interest in education". Rather than a selection procedure, there were "conditions of entry" to the courses; usually a written or tacit agreement that the child would do homework regularly, would remain at school until the end of the course, would work hard and behave well. The actual selection for the courses took place in the home rather than in the school; the brighter children, and those from a middle-class home background, were more likely to wish to stay on than the others. Administrative provision was made for children in a school with no course to transfer at 15 to one which had a course; but little advantage was taken of this, except in the case of the pre-nursing courses.

To ensure the success of the courses, it was not enough to persuade the parents and the child that the latter should stay; the children's interest and enthusiasm had to be maintained, and morale on the courses kept high. This was done in various ways: the use of easy examinations, in which success was fairly certain; extensive publicity of past successes; granting the fifth-year children small privileges *vis-à-vis* the rest of the school; and keeping them well informed, so that they could understand the purpose of their work. High morale was imperative, since the group who stayed would be under considerable pressure for going against the norm of their group, which is to leave school at the earliest opportunity and begin work. It was also necessary as a means of restoring the children's confidence in their own ability to pass examinations. As long as these two threats remain, the courses will be somewhat tender plants; my own inquiries suggested that the numbers staying on in a school may drop noticeably when a change in the Headship takes place.

3. CONSEQUENCES

Four consequences will be considered: firstly, their effect on occupational opportunity; then the two principal effects of the courses on the schools—their incentive value and the increased social training they make necessary; and finally their impact on the prestige of the secondary modern schools. The distinction between the features of the courses and their consequences is not, of course, a hard-and-fast one.

(*a*) *The Courses and Occupational Opportunity* (4)

Most children seemed to stay primarily because they believed that the courses would help them to achieve their ambitions. As would-be apprentices can increase their chances of success by obtaining a U.E.I. technical certificate, there are *a priori* grounds for supposing that the children who stayed on gained occupationally. Heads thought that the children who stayed at school were more likely to undertake further education, and to succeed, than the others. It is not yet possible to draw any firm conclusions about this, but a few tentative suggestions can be made from the available data. Even if they did not sit for G.C.E., those who stayed entered, on the average, noticeably "better" occupations than those who left the secondary modern schools at 15 (4). This is not altogether a fair comparison, as we have seen that those who stayed tended to be the brighter and more ambitious ones. A fairer comparison would be with those of ability and ambition who left senior elementary schools a generation ago and attended evening classes (5). Again, the comparison is not a perfect one: on the one hand, the ex-elementary school group is much bigger; on the other hand, they have had 20 years or more in which to gain promotion. The general conclusion which emerges from this comparison is that the children who took a non-G.C.E. fifth-year course were given the chance to "do better" than their fathers (4).

Those who stayed on and took G.C.E. "did appreciably better" than those who stayed on without taking it. In general, they entered occupations as "good", or almost as good, as those who left the grammar schools at the same age with roughly the same qualifications (4).

(*b*) *The Courses as an Incentive*

This was one of the consequences most regularly mentioned. About three-quarters of the Heads drew attention to it, and some added that it was by no means limited to the fifth-year children. Heads' tributes to this incentive value were often warm: "their whole attitude to school and work changes as soon as they begin (the fifth-year course)"; "they feel themselves to be students"; "it has raised the standard of work throughout". The clearest sign of their incentive value was the courses' power of self-propagation. Their growth has been rapid, if not spectacular; yet it has been achieved almost entirely by persuading children already in the school to stay on. Nearly all the Heads who had no fifth year told me how much easier it would be to persuade children to stay on if they could see a course at work in their own school. "When the younger ones see certificates being presented they too begin to see the benefits of staying on." Four Heads told me that "the children have a sense that there must be something in school for those to put in an extra year"; and two were already referring to a "fifth-year tradition". The incentive also affected some of the children from the lower streams who were staying on, according to their Heads, "primarily to mature".

Although my inquiry was limited to the children, the courses must have acted as an incentive to the staff, too. The opportunity to do more advanced work, the change in the children's general attitude to school, and the smaller classes, cannot fail to have made a considerable impact.

The incentive value of the courses throws some doubt upon the validity of the fear, so often heard, that a fifth-year course must involve a concentration of attention on the brighter pupils, at the expense of the rest. To put these fears into perspective, it should be noted that all human societies tend to concentrate their efforts in the field of education on the extremes: those considered supernormal, who are trained to become the *élite* of the next generation; and those regarded as subnormal, who are put under great pressure to "come up to" normal standards. Our own society is no exception. "Neglect" of the ordinary child is a widespread phenomenon, and is probably built into the educational system at a fairly fundamental level.

One might, therefore, go so far as to say that everything but their professional ethics "conspires" to encourage secondary modern school Heads to concentrate on the brightest (and the dullest) ones—especially when their parents are the most vociferous, co-operative and influential, and share the Head's own values in education and other respects. There was naturally little evidence in this inquiry of any obvious "neglect" of the rest of the school; for the subtler forms of neglect, one could only ask the Heads' opinions. Of the eleven who were asked, three felt that there was still some, three felt there was none; the other five were non-committal or said only that they tried to ensure that there was none.

(*c*) *The Courses and Social Training*

A second important effect of the courses on the schools was the social training they made necessary. It was the writer's impression that the courses had facilitated such training, and had at the same time necessitated a greater, and perhaps more conscious, emphasis on it. If they were to compete on equal terms with the grammar school children for non-manual posts, and lead a normal middle-class life, many modern school children had to be taught the social graces. Among the values of the courses most often mentioned to me was the greater poise and maturity which resulted. This may have been reflected in a greater willingness to wear school uniform. It was taught most obviously through the prefect system, which often trained the children (particularly in girls' schools) as hosts and hostesses, to reply to votes of thanks, and to be all that is implied in "an example to the school". As a result of this greater social training, it was often difficult at a glance to distinguish the younger staff from the senior pupils, unless the latter were in school uniform.

(*d*) *The Courses and the Schools' Prestige*

The effect of the courses on the modern schools' prestige, in the eyes of parents and teachers, also deserves consideration. Unfortunately, it is not possible to make reliable inferences about the schools' prestige in the eyes of the "general public". It seems indisputable that the secondary modern schools are trying to achieve parity of esteem with the grammar schools. A well-proven way of establishing a claim to equal prestige would be to resemble the prestigeful as closely as possible. In the present case, this means introducing all the outward signs of the grammar school: G.C.E., prefects, school uniform, homework, houses and a sixth form. This is not to suggest that the modern schools would adopt these outward signs purely for their prestige-value, but that a school which adopts them because they have proved useful elsewhere is likely to gain in esteem from doing so.

Parents' increased confidence in the secondary modern schools which have a fifth year is indicated by the recent hints of a decline both in the strength of the passions aroused by the 11-plus (6) and in the proportion of children who leave the schools as soon as they are allowed to. Nearly all the Heads who were asked thought that the disappointment their children felt about the 11-plus had been lessened by the introduction of the courses. A few added that some children were turning down the chance of transferring to a technical school at 13, in order to take a fifth-year course. The proportion of children staying on at modern schools at least one term has grown nationally from about 10% in 1948 to over 20% in 1958; and the percentage of modern school children staying for a fifth year of secondary education has risen nationally from $3\frac{1}{2}$% in 1949 to 7 in 1957.

It was difficult to find any clear indication of the esteem in which the schools were held by the teaching profession; but from the proportion of their staff who were graduates, it was possible to make inferences about their prestige in the eyes of graduate teachers; in this respect, too, their status is slowly rising.

It seems, then, that the prestige of the schools has risen, in both the professional and the parental eye. But parity is not likely to be achieved for some time. The courses are still new, and Heads felt it was still necessary to notify parents of their existence. The Heads (and probably the more discerning parents) have set very high targets, perhaps too high. This emerged very clearly when I asked whether they considered their own fifth form comparable with a grammar school fifth, as regards the courses and the teaching. Most of them seemed automatically to compare their own with the *upper* streams of the grammar school fifth, rather than the *lower* streams, although on the basis of the 11-plus their children had less ability. About half thought that their G.C.E. stream was comparable; the others did not think that any of their courses were yet comparable. In the eyes of parents who use the same criteria for the comparison, equal prestige can be achieved only when all schools have established G.C.E. courses; but there are many parents who do not, and for them the gap has probably been largely closed.

4. THE COURSES AND SUPPORT FOR THE COMPREHENSIVE SCHOOL

Lastly, I should like to speculate on the rôle of the fifth-year courses in the "battle" between the tripartite and the comprehensive systems of education. While it is true that the defenders of tripartitism are more likely to base their case on the proven value of the grammar schools than on the excellence of the secondary modern schools, the experience of the modern schools is not unimportant. Both political parties have been anxious to encourage the development of fifth-year and local-examination courses. The Conservatives' main object seems to have been to make the tripartite system flexible, and hence more worthy of survival. The modern schools can survive only if they *do* encroach upon the traditional functions of the grammar schools; without such overlapping there can be no equality of opportunity. In support of this, the claim is sometimes made that the slower pace of the modern school would be more suitable for many of those who at present find their way into the C streams of the grammar schools.

The courses have not only buttressed the tripartite system; they may also have weakened the case for a comprehensive one. The Socialist support for comprehensive schools seems to have two main foundations: the desire to educate in the same school children of all levels of ability and from all sorts of background; and the desire to provide equality of opportunity. Many hold that the second aim is implied by the first, and cannot be achieved in isolation from it. In their view, the success of the courses does not weaken, and may even strengthen, the case for a fully comprehensive system.

My personal view is that the success of the courses shows that equality of opportunity can, to a considerable extent, be achieved without abandoning the tripartite system. If many others have favoured the comprehensive solution only as a way of equalising opportunities, and now withdraw their support, the fifth year courses will have contributed to the survival, for better or worse, of a tripartite system, as well as helping to meet the demand for more trained manpower and to raise the prestige of the secondary modern schools.

NOTES AND REFERENCES

1. This is a digest of part of Morris, R. N., *Some Social Consequences of the Introduction of Extended Courses into Birmingham's Secondary Modern Schools*, unpublished M. Soc. Sc. thesis (University of Birmingham, 1959). The writer would like to acknowledge with deep gratitude the constant help of his supervisor, Dr A. H. Halsey.
2. These are the details given in the City Education Committee's pamphlet, *Fifth Year Courses* (May 1957 ed.). Many of the schools also had small courses with other biases, which had not yet been submitted for official recognition.

3. This figure includes those transferred to a technical school at 13-plus. See Russell, E. L., "The Organisation of Secondary Education: Birmingham", *Education* (5th December 1958).
4. The Youth Employment Service of the City Education Department most kindly made available some unpublished statistics on the first occupations entered by Birmingham's fifth-year children, hardly any of whom had taken G.C.E. The number of children involved was rather small—74 boys and 67 girls—so the conclusions must be regarded as tentative. Some valuable data on the occupations of modern school children with G.C.E. are given in Petch, J. A., *After G.C.E.*, N.U.J.M.B. Occasional Publications no. 4, 1957. For reasons of space, the detailed comparisons cannot be given here; they will be found in Morris, op. cit., ch. VI.
5. Glass, D. V., (ed.) *Social Mobility in Britain* (Routledge, London, 1954), pp. 296, 297.
6. For striking evidence of this at Bournemouth, see the *T.E.S.*, 30th November 1956, p. 1403.

THE STATUS OF THE TEACHER IN ENGLAND AND WALES

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PART II: PRESENT POSITION

A NUMBER of attempts have been made, particularly in America, to obtain an objective assessment of the relative prestige of occupations. Typical of these is the research of Hall and Jones (1) in which 1,500 people were asked to rank, in order of social standing, thirty occupations selected to cover the whole status range. Mean ranks calculated for each occupation placed "elementary-school" teacher tenth with farmer, Non-Conformist minister and works manager just above, and jobbing builder, news reporter and commercial traveller just below. It is concluded from these results that teachers are somewhere "in the middle of the middle classes".

But data of this kind, even if reliable, is of limited value. The status accorded to a particular occupational group cannot be expressed in numerical terms; it is a complex of attitudes concerning certain characteristics of the occupation and is essentially qualitative and subjective in nature. There are, however, certain factors which appear to be of major importance in determining the status of an occupational group and it is of value to examine the teaching profession in relation to each of these.

(1) *Public Evaluation of Professional Services*

The first factor is the value placed by the public upon the service given.

One of the biggest tasks facing the pioneers in educational development a century ago was to convince people that education was a good thing. Many politicians were actively opposed to education, except for the upper classes. Industrialists were hardly interested: there was an adequate supply of workers literate enough to handle the simple clerical work of the time and little technical knowledge or skill was required by those engaged on production processes. Parents were opposed because children at school were unable to make any contribution to the family purse; and the children were apathetic because they saw no sense in the dull routine of rote-learning to which they were subjected. How different is the climate of opinion to-day! To quote Lord Hailsham, speaking in April 1957: "The education service is on the way up because public opinion is taking a new, and radically higher, view of public education than in the past, and because, measured by this new standard, our present educational achievements are inadequate (2)."

Evidence of the nation's concern for education is provided by the upward trend in expenditure over the last ten years. In 1947, the expenditure of local education authorities in England and Wales totalled 168 million pounds; by 1957 expenditure had risen to 495 million (3). The White Paper giving details of grants to be paid under the block grant system estimates that educational expenditure will rise to 633 million pounds in the financial year 1960/61 (4) and it is likely that it will go higher still.

Further evidence of the high importance now given to education is provided by the recent White Paper outlining the government's plans to improve secondary education at a capital cost of 300 million pounds (5). And the decision to extend the period of training for teachers to three years from September 1960 shows that the nation realises that the high educational standards needed must come from the teachers themselves.

The editors of the 1956 *Year Book of Education* opined that "the nature and intensity of the national effort for education provide a peculiarly reliable index of the national will for the future (6)". All concerned for the future well-being of the nation can be encouraged by the present concern for education but teachers can be especially cheered since it augurs well for their future professional status.

(2) *Professional Knowledge and Skill*

A second factor affecting the status of a professional group is the extent to which its practice depends upon a body of knowledge and skill not possessed by the layman but which must be mastered by each practitioner before he is allowed to discharge his duties.

It is a commonly held view that teachers do not possess, or even require, any special skill for their work apart from a knowledge of the subjects they teach. And it is considered by many that no more knowledge is needed than that which is to be taught. Both views are wrong!

Firstly, a teacher can only teach with conviction and enthusiasm from a deep knowledge and understanding of that which he is

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Journal of the Institute of Education, University of Birmingham

Editors

E. A. Peel, M.A., Ph.D., H. J. Hallworth, M.A., A. M. Wilkinson, M.A., Ph.D.

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teaching; and deep knowledge and understanding are obtained only by those able and willing to pursue exacting and disciplined study over a long period.

Secondly, if a teacher's work is to be effective it must be based on an understanding of his pupils as individual persons, and this requires not only a knowledge of the general principles of child development and learning theory but considerable clinical experience in the diagnosis of individual character and personality as well.

The good teacher knows these things from his own experience but the layman does not, and it is unlikely that he will be persuaded by force of argument. He will, however, be influenced by two things: by the academic standard demanded of those entering the training colleges and by the quality and length of the course needed to attain qualified teacher status.

The published minimum requirement for admission to a training college, a General Certificate of Education with five passes at the Ordinary Level, gives the impression that admission standards are low. This is not true. During the past ten years standards have been rising and competition for admission is now very keen. Increased competition for places has inevitably led to a rise in the academic standard of those accepted and candidates with the minimum qualifications must possess strong additional qualifications to stand a chance of acceptance to-day. Statistics giving the academic qualifications of all those accepted for admission in September 1958 are not available but the tables given below for the intake to the writer's college may be of interest.

TABLE 1

ACADEMIC QUALIFICATIONS OF MEN ADMITTED TO THE CITY OF WORCESTER TRAINING COLLEGE IN SEPTEMBER 1958

Number of "O" level passes	*"A" Level Passes*				*Totals*
	0	1	2	3	
4	–	1	1	1	3
5	4	4	6	2	16
6	7	5	4	1	17
7	4	9	4	4	21
8	1	4	2	1	8
9	2	2	–	–	4
10	1	–	–	–	1
Totals	19	25	17	9	70

Total number of students = 70

TABLE 2

ACADEMIC QUALIFICATIONS OF WOMEN ADMITTED TO THE CITY OF WORCESTER TRAINING COLLEGE IN SEPTEMBER 1958

Number of "O" level passes	*"A" Level Passes* 0	1	2	3	*Totals*
4	–	1	–	–	1
5	1	1	2	3	7
6	4	3	1	–	8
7	3	4	3	5	15
8	3	3	7	7	20
9	2	2	4	3	11
10	–	2	3	2	7
11	–	1	–	–	1
Totals	13	17	20	20	70

Total number of students = 70

The time is opportune for raising the minimum qualifications to include one pass at Advanced Level. This would provide the necessary incentive for serious study at sixth-form level and ensure that all entrants to the colleges had experience of scholarly study in at least one subject. It would also disabuse those who think that a general education to the Ordinary Level of the General Certificate of Education provides an adequate background for admission to the teaching profession. It is true that the colleges would still wish to accept a number of candidates with special gifts, for example in physical education, but these could be dealt with through the provisions for exceptional admission under the direction of area training organisations.

The introduction of the three-year course in 1960 will mark a major advance in the standards demanded for qualification. The longer period of residence in college, greater emphasis on individual study and tutorial methods as against formal lectures and the devolution of greater personal responsibility to the students themselves will all play their part in developing the educational background and maturity of students. Newly qualified teachers leaving the colleges from 1963 onwards will certainly be better prepared to accept the responsibilities of their first appointments; they will also have greater potential for development, a more significant factor in relation to their future status as professional people.

At the same time it must be realised that even after a three-year course young teachers will not go into the schools fully competent. Teaching is an art which can only be learned by experience and, to quote Sir Ronald Gould, "the colleges can do little more than provide the necessary intellectual framework on which future experience will be built (7)". The teaching profession must accept that the first two years of full-time teaching form part of the professional training of a teacher closely akin to the medical student's years walking the wards; and the salary structure should reflect that view.

(3) *Practice and General Principles*

The third criterion by which the status of a profession is judged is the extent to which its practice depends upon the application of general principles.

In the training college of forty years ago the most important member of staff was the Master of Method. He was responsible for the training of students in teaching techniques and he knew all the answers. If a student wanted to know how to teach division of fractions the Master of Method told him: there was only one way of doing it. In fact, students frequently left their colleges with a complete set of lesson notes to cover all the work of the elementary-school curriculum.

Now any occupation which involves merely the efficient execution of a set of routine techniques will not be accorded very high status and the elementary-school teacher came into this category. He was a skilled craftsman and was regarded as such.

To-day there is no Master of Method in the training college; it is realised that every teaching situation has its own unique features, including the teacher, and demands its own method. Students are, of course, given certain general principles to guide them in their work but what they do in any given situation depends on them. In their first years of teaching they will be less sure than their well-trained predecessors, and that must be so for, having no ready-made answer to each problem that arises, they must feel their own way. But they are feeling their way to something creative, and therefore dynamic, and the effectiveness of their preparation must be judged not in terms of their initial competence but by the vigour, initiative and imagination they show after they have been teaching a few years.

One should note, too, the major change which has occurred in the approach to teaching. Teachers no longer give instruction to large groups of children and measure their success by the number who reach a pre-determined level of competence. They are now concerned with individual children and encourage each one to make progress consistent with his ability. Because of the infinite variety of human personality each child must be treated as an individual and it requires a teacher of rare quality to get the best out of everybody. But that is the need and the responsibility which each teacher must accept if the potential ability of the rising generation is to be developed to the full.

(4) *Professional Freedom*

High status is accorded to those professions in which a great measure of freedom is allowed to the practitioner to do his job in accordance with the dictates of his own knowledge, understanding and conscience.

There is no more significant pointer to the growth in stature of the teaching profession than the freedom which the individual teacher enjoys in fulfilling his professional responsibilities. Once the general character of a school has been determined the head teacher and his colleagues do the rest. It is they who determine the content of the curriculum and the syllabuses to be followed in each of the subjects. And as far as the day-to-day work is concerned, each teacher accepts an assignment in very general terms, being free to organise it as he sees fit in relation to the needs of his pupils. There are, of course, certain restraints, for example, the requirements of examining authorities and the demands which professional bodies and employers make on their recruits. The work of a school is also subject to constant challenge from a number of quarters, including Her Majesty's Inspectors, officials of the local authority and members of the public, especially parents. Nevertheless the freedom given to the teaching staff is very real and is only possible because public opinion takes for granted that the teachers will accept their responsibilities seriously and discharge them honourably and in good faith.

The relationship between the Ministry and the teachers in respect of their professional responsibilities is clearly indicated by the title of its most important publication concerning the work of the schools, a *Handboook of Suggestions for Teachers*. In most countries such a publication would include "instructions" or "regulations", not "suggestions". Just after his appointment as Minister of Education in 1957, Lord Hailsham made a characteristically humorous comment on this situation. Contrasting his responsibilities as Minister of Education with those he previously held as First Lord of the Admiralty, he said: "In the Admiralty you are a person having authority. You say to a person 'come', and he cometh; 'go', and he goeth. It is not so in the Ministry of Education. You enjoy influence rather than power. You suggest rather than direct. You say to a man 'come', and he cometh not; 'go', and he stays where he is (8)."

It has been said that the existence of Her Majesty's Inspectors imposes a major restraint on the professional freedom of the teacher. No-one would deny that Her Majesty's Inspectors exert a powerful influence in our educational system, but they do this as advisors and have no power to direct. The Minister himself made this quite clear when he said in his annual report for 1949: "Schools do well to remember that an inspector's advice is really advice, and advice that need not be followed (9)."

There is no doubt that the teacher in this country enjoys a measure of professional freedom which is the envy of his colleagues in other parts of the world. That is something to value and respect; it is indicative of the high status he has won.

Professor Barbara Wootten has said that "A profession, like a nation, is a group of people who have persuaded other people to treat them as such (10)". Teachers, by the quality of their service in the past have achieved a large measure of the respect which is accorded to professional people and Lewis and Maude paid them a handsome compliment when they wrote: ". . . few other professions can compare with the devotion of the teachers. Except for a vocal minority they have been unbelievably patient in working conditions which have tried them to the limit, and they have unhesitatingly put the interests of the children first (11)."

And Professor Dent says in his inspiring little book *To be a Teacher*: ". . . so highly do I rate the teacher's function that in my opinion no nation with any due regard for its civilisation and culture would dream of giving national education anything but the first priority in the allocation of its mental and spiritual resources, even to the point of danger to other occupations if need be. None but the finest and fittest among its people ought to be allowed to engage in the supremely important task of educating the young, who constitute the national asset upon which the value of all other assets absolutely depends (12)."

None but the finest and fittest ought to be allowed to educate the young! The status of teachers has certainly changed since the days when Macaulay could describe them as "the refuse of all other callings" and Joseph Lancaster could assert that "any boy who can read can teach". And there is no doubt that with the increasing demands now being made on the education service this status can rise even higher: it is the duty of those who are active members of the profession at this critical time to see that it does.

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DICKENS EDUCATES HIS SONS

by P. A. W. COLLINS
Warden of Vaughan College, University of Leicester

TEACHERS who marry risk being discredited by offspring who are manifestly ill-nurtured: "Physician, heal thine own children." It is a reproach prudently avoided by most of the novelists esteemed for their sympathetic understanding of children; George Eliot, Lewis Carroll, J. M. Barrie, Henry James, D. H. Lawrence, Virginia Woolf, Forrest Reid—all were single or childless. Dickens, however, who virtually introduced the child and the school into English fiction, was as fertile in his marriage as in his invention. Hans Andersen, visiting him in 1847, was delighted to see his children: "We have an abundance of those," said Dickens, laconically: and more were to follow. Two daughters and seven sons survived infancy. Expense apart, Dickens had ample material for educational experiment. What schools, then, were chosen by the creator of Squeers and Blimber, of Creakle, Strong, M'Choakumchild and Headstone? and how did his children fare?

George Orwell, noting the "woolly vagueness" of good Dr Strong's régime, inferred that Dickens merely wanted "a moralised version of the existing thing. . . . It comes as rather a shock to learn that he sent his eldest boy to Eton and sent all his children through the ordinary educational mill." Dickens was, however, aware of and sympathetic to some educational experiments of his age: he was a frequent and admiring visitor to England's first kindergarten, and enthusiastic about Bruce Castle, a remarkable "progressive" school, devised by Rowland Hill. But he did not send his own infants to the kindergarten, though it was his neighbour in Tavistock Square; and though he favoured Bruce Castle for his eldest son Charley, he entered him instead at King's College School. Miss Burdett Coutts, the heiress and a friend of the family, had undertaken to provide his education, and presumably had more conventional ideas. Charley attended King's College, however, for only a few weeks before succumbing to scarlet-fever (Dickens frugally secured a return of £6 1s. 2d., fees paid in advance). For reasons unknown, Charley did not return to King's College, but rejoined his previous school, with his next brother. As Dickens put it, "Charley and Wally have been taken this morning to school in high spirits, and at London Bridge will be folded in the arms of Blimber".

"Blimber" was Mr Joseph King, who kept a private school in Maida Vale. One, not very reliable, witness says that King's mannerisms suggested Dr Blimber (*Dombey* was being written then). Certainly Miss Blimber—that ghoul, "dry and sandy with working in the graves of deceased languages"—was suggested by Miss Louisa King, who shared the classics teaching with her father. Not that, in person or pedagogy, she resembled Miss Blimber; she was, said Charley, "an amiable young lady", but the idea of a young lady's teaching Greek and Latin then seemed comically eccentric, and was duly incorporated into the novel. Otherwise, the Kings were most unlike the Blimbers. Mr King inspired affectionate panegyrics from other pupils of these years, Alfred Ainger and Frederic Harrison; he clearly was a remarkable, original and charming master, "dear, large-souled, wise . . . the type of all a teacher should be" (Harrison thought, after seventy years of educational experience). Though not a soft master, he made all lessons "a thorough pleasure", and invented a method of teaching fluency in the classics without any grammatical grind. He was "far in advance of his time", we are told. "He could not bear mechanical lessons, and tried to make learning part of life instead of making life into learning. To his pupils he was ever a man first, not a pedagogue. . . . There was no academic mustiness in the school atmosphere." Altogether, the sort of teacher Dickens might be expected to approve—a Dr Strong, but with a mind and some vitality. Without using Blimber's "forcing apparatus", King got his pupils well forward, as Charley and Wally found when they left for other schools. Dickens was "much pleased" to hear this of Wally, "as I had always thought him rather slow—though I have never made the mistake of attempting to quicken him, I must add in self defence".

Charley indeed found work at Eton too easy. At first he delighted his father by his popularity, progress and prizes (one of them dauntingly inscribed "Remember who you are; of what father born"), but later he had to "stop his boats", as a warning against laziness, and eventually he pronounced the tolerant Eton system "a particularly bad one for such a character". Charley had been intended for the army, but opted for commerce instead. Dickens discussed the matter with him, but deliberately not with Cookesley, his Eton tutor: "He is very fond of Charley, and has a high opinion of his abilities, and would like nothing better than to keep him making Latin verses for the next five years. Quite natural to a man of his pursuits, but not quite rational in such a case." So Charley left Eton before he was 16, to spend two years abroad learning German. Dickens, who had left school at 14, was often to lecture his sons, in tones typical of the self-made man, about "When I was your age . . .". Though he satirised some of the vagaries of "Useful Knowledge", he held decidedly utilitarian views on the education of lads in their teens. "I quite approve of his discontinuing Latin," he wrote of another son, then at 15 in his final year before emigrating; the boy should concentrate on the things he would need "in a rough wild life. . . . I hope he will take better to the Bush than to Books."

Most of the sons left school at 16 or less: only Alfred stayed till 17, and Henry till 19. This was partly because most of them were intended, at one time or another, for early entrance into service cadetships, the patronage of Dickens's influential friends proving useful here. Moreover, the education of seven sons, and the upkeep of two daughters with fairly expensive social ambitions, not to mention the support of his improvident parents and brothers, must have strained Dickens's finances, as it certainly strained his patience. "I can't get my hat on in consequence of the extent to which my hair stands on end at the costs and charges of these boys," he wrote in 1868: "Why was I ever a father!" Such exclamations had long been frequent, the jocularity wearing thinner with the years. Only one boy, Henry, went to a university. "Very bright and clever," Dickens had described him at 13, but he was almost alarmed three years later, when Henry hankered for Cambridge instead of his destined post in the Indian Civil Service. "Many of us," Dickens replied, "have many duties to discharge in life which we do not wish to undertake." He told Henry's headmaster that he could "by no means afford to send a son to college who went there for any other purpose than to work hard, and to gain distinction", so unless he had "the qualities and habits essential for marked success" at Cambridge, he should "decidedly" sit the Indian examination. Henry and his headmaster weathered this storm, and though his final performance at Cambridge was creditable rather than distinguished, he was able to rejoice his father's last year of life by winning a scholarship and an essay-prize. Forster, indeed, doubted if anything ever more truly pleased him than this success of Henry's; and at the time, Georgina Hogarth, Dickens's sister-in-law and housekeeper, remarked, indicating the source of his delight: "I have never seen Charles so happy about anything for a long time. . . . It will be quite a new sensation for [him] to have one of his sons distinguish himself."

Henry had attended three schools, all of which were patronised by one or more of his brothers. At the age of nine, he joined three of them at an English school in Boulogne, run by a clergyman and a former Eton master. He felt "rather sad and forlorn", away from home so young, though the others had been even younger when they began there. The school, recommended to Dickens by Delane of *The Times*, was "satisfactory in every respect", Miss Hogarth notes. Dickens was enthusiastic about the Eton master: "I have never seen a gentleman so perfectly acquainted with boy-nature. There was a perfect understanding between him and his charges; nothing pedantic on his part, nothing slavish on theirs." The boys—he assured an inquiring parent—were "very happy", the domestic arrangements were good, and the fees fair. On the curriculum, he was brief: the teaching was "unusually sound and good", and French was the boys' daily language. A continental schooling was then quite common for English children. As a contributor to Dickens's *Household Words* in 1857 explained, the standard of teaching was generally higher than in England, the schools being properly supervised by the State; corporal punishment was almost unknown; the food was good, and the favourite area—Boulogne and Calais—was both invigorating and easily accessible. Many of the schools were kept by Protestant clergymen, so the boys enjoyed the linguistic advantages of a French education, without its spiritual perils. It is sad to turn from these encomia to Henry's *Recollections*. He could not, he said, look back on Boulogne with any degree of pleasure. The food was unappetising, the picturesque ramparts—which so delighted Dickens—were the hated treadmill for crocodile parades (not unlike Blimber's at Brighton), and "their methods of teaching us French were altogether and radically wrong". Any boy caught speaking English was given an incriminating token, and was punished if he still possessed it next day. The only way he could rid himself of it, was by forcing it on some schoolfellow whom he detected in the same misdemeanour. A sinister outcome, perhaps, of the Rev. Gibson's "perfect acquaintance with boy-nature": but it is fair to add that another brother, fifty years later, on returning from Australia made a pilgrimage to the "well-loved spots" in Boulogne.

Henry left Boulogne earlier than his elder brothers, being summoned home to accompany the next and youngest brother, Plorn, to Rochester Grammar School, near the Dickens home. Plorn was always shy and difficult; he stayed longest at home, and when once he admitted liking a school, Dickens hailed this as "the great social triumph of modern times". Henry and Plorn soon left Rochester for Brackenbury and Wynne's school at Wimbledon, where two of their brothers had preceded them. "A very well-known private school, then at the height of its fame," Henry described it; Dickens called it, with exaggeration, "a great Public School", and more accurately, "a great school, where they train for India and the artillery and engineers". Walter had qualified there for an East India Company cadetship; Alfred went, to prepare for Woolwich, though eventually he proved unfit to face the competition. It was a strongly disciplined school: "I don't think I ever saw boys more closely stoned than at that eminent Grinder's," wrote Dickens, referring jocularly to the Charitable Grinders of *Dombey*. Walter "reported joyfully" of it, and Henry flourished there, eventually becoming Head Censor; but Plorn, never at a loss for sorrow, found it "confusingly large", and transferred to a private school in Tunbridge Wells, kept by an amiable clergyman whom even Plorn liked—a school which, incidentally, was making holiday excursions to the Continent back in 1864. Plorn described his Italian school-visit in the *Gad's Hill Gazette*, the "newspaper" printed by the younger Dickens boys.

Plorn also spent seven months at the Royal Agricultural College, Cirencester, before emigrating for Australia. The full course there lasted two years, but Dickens was informed by friends that "the practical knowledge of farming he requires is, for Australian purposes, of a very limited nature". So, at 16, he embarked—his father entirely breaking down when the parting came. "By the Lord," Dickens had written a few months earlier, with notable lack of insight, "he ought to be a first-rate settler after all his cramming!"

Such were the main schools to which Dickens sent his sons. The seven of them needed, at various periods, other teachers—governesses and tutors, coaches for the services or for the Etonian insistence on "certain verses in imitation of Horace (I really forget what sort of verses)", schools or daily masters in Italy and Switzerland and France when the family was living there; Auntie Georgina taught them their letters, while Dickens himself gave Frank unavailing exercises for his stammer, and Henry hilarious lessons in shorthand. The girls we have ignored: they had a French governess, and various masters in the proper accomplishments. It is amusing to find Dickens taking them to Paris "to complete their polishing" in the year when he began *Little Dorrit*, which contains that great polisher Mrs

General, the proponent of "prunes and prism". Katey also studied, with Dickens's warm encouragement, at the Bedford College art-classes; she was later a minor professional painter. The range of schools was no larger than so extensive a family might entail. They were, in general, respectable and competent rather than adventurous establishments. Most of them had been attended already by the sons of Dickens's friends—artists, journalists, professional men of various kinds. They were not cheap schools; nor, on the other hand, did Dickens spend lavishly on all the seven boys' educations. The schools were not greatly better or worse than might plausibly be chosen by any reasonably affluent mid-Victorian *paterfamilias* not bound by family tradition to the public school routine.

Henry alone of the boys had a distinguished career, becoming Common Serjeant and earning a knighthood. The sons of great writers rarely achieve distinction, but the record of the Dickens boys was predominantly dismal, as we have learned more fully from Professor Adrian's recent book, *Georgina Hogarth and the Dickens Circle.* One of the present members of the family, discussing this general atmosphere of failure, remarked that "None but Henry were properly educated." Certainly Henry stayed longest at school, and went to Cambridge; the others' schooling was not prolonged, and some of them attended too many schools too briefly. Thus, Charley spent two or three years, from the age of 10, "considerably engaged in working up those arrears of education which had accumulated alarmingly during the foreign trips". But the boys had a fair education, ending (in every case but one) with specialised training or "cramming" for the occupation they were to follow. Their subsequent failures resulted much more, one would guess, from faults of character than from scholastic inadequacies. The Micawber streak, so conspicuous in Dickens's brothers as well as his father and so sternly repressed in himself, recurred in most of the sons. When Dickens died, Charley had already undergone a bankruptcy: "Clever indeed," a later employer said of him, "but with no natural gift for getting on in the world." Walter had died in India, leaving many debts unpaid; Sydney, a promising young naval officer who was also to die young, had written in desperation to his father, having almost ruined his career through debts, and Dickens's last letter to him had forbidden him to visit the family when next on leave. Francis, "the cleverest of us all" according to Henry, was crippled by a stammer and other nervous afflictions; he was serving in the Bengal Police, and his later career was a mixture of follies and gallantry. Plorn, Dickens's youngest and erstwhile favourite, was taking very badly to Australia, where his later career proved unimpressive and was punctuated by financial ruin. "He seems to have been born without a groove," his father lamented. "It cannot be helped. If he cannot, or will not find one, I must try again, and die trying." The only boys the dying Dickens could regard with complacency were Alfred, who (though he had left the customary pile of debts in London five years before) was now laying the foundations of a tolerable business career in Australia, and Henry, working well at college and making his mark in the Cambridge Union.

To attempt to explain these various failures would take us far beyond schools and education. The hereditary Dickens Micawberism has been mentioned; and perhaps Dickens was not altogether unjust in suggesting, of one of the sons, that "he inherits an indescribable lassitude" from his mother. Even Dickens's bitterest critics have not maintained that the wife he virtually expelled from the home was a woman of strong character, or a vigorous influence in the family. Perhaps Dickens, however, was too strong and vigorous for his children's good. His notorious obsessive concern for tidiness and punctuality, for instance, and the régime through which this was enforced on the family, led to muttered resentment against this "slavery", "degradation", and so forth. Of Charley, Dickens wrote, "Nothing but the conviction formed in his infancy that it *must be done*, renders him attentive to the little points of punctuality and order required of him at home." Perhaps Charley, and the others, reacted later against these repeated injunctions. In the same letter, Dickens remarked that "he has less fixed purpose and energy than I could have supposed possible in my son"; and this suggests another possible reason for the boys' indifferent success. Like other able, energetic, and successful fathers, Dickens was prone to excessive impatience and disappointment with sons so conspicuously lacking his virtues (though in earlier letters he had often made pathetically optimistic assessments of the elder boys' abilities and prospects).

In his closing years, his disappointment—which had ample provocation—became more intense and vocal. He wrote, three years before his death, of his boys—"with a curse of limpness on them. You don't know what it is to look round the table and see reflected from every seat of it . . . some horribly well remembered expression of inadaptability to any thing." A couple of years later, two intimate friends were discussing him. "Yes, yes," said one, "all his fame goes for nothing since he has not the one thing. He is very unhappy in his children." The other recorded this remark in her diary, adding the comment, "Nobody can say how much too much of this the children have to hear." Dickens had been a delightful and imaginative father to his children when they were young and, though he grew more reserved towards them as they grew up, he remained fond of them, intensely fond in some cases. Most of them, in return, remained throughout their lives deeply loyal and affectionate to his memory. But his handling of them—as of so many of his fictional heroes and heroines—in adolescence and young adulthood was often lacking in ease and felicity.

BOOK NOTICES

HANDICAPPED CHILDREN—THE CHANGING OUTLOOK

I. R. and A. W. G. EWING, *New Opportunities for Deaf Children* (U.L.P., 1958, 15s.).

RALPH WINTERBOURN, *Caring for Intellectually Handicapped Children* (New Zealand Council for Research in Education, 1958, 4s. 6d.).

F. J. SCHONELL, J. A. RICHARDSON and T. S. MCCONNEL, *The Subnormal Child at Home* (Macmillan, 1958, 5s.).

ANN M. CLARKE and A. D. B. CLARKE (ed.), *Mental Deficiency—The Changing Outlook* (Methuen, 1956, 45s.).

W. CRUIKSHANK (ed.), *Psychology of Exceptional Children* (Staples, 1958, 50s.).

M. F. CLEUGH, *The Slow Learner* (Methuen, 1957, 13s. 6d.).

IN recent years, there has been an increased interest in the welfare and education of handicapped children. The provisions for handicapped children resulting from the 1944 Education Act stimulated administrative action. There has been a more enlightened and sympathetic attitude developing in the general public and a greater participation by various professional workers (psychological and social as well as medical) in the treatment and education of handicapped children. Currently, the increase in facilities for training teachers of handicapped children reflects the community's increased concern for the handicapped. It is not surprising therefore that more books about these problems have been appearing and a selection of them is considered here.

The work of the Ewings in Manchester on the education of deaf children is an inspiring example for workers in other fields. They are able to write about the methods of educating deaf children with the knowledge gained from 40 years of combined research and practical experience. Their new book, *New Opportunities for Deaf Children*, replaces *Opportunity and the Deaf Child* (1945) and incorporates the new knowledge that has been acquired as well as information about the improved equipment and techniques that have become available. Whether or not the reader is specially interested in the education of the deaf, the account of what it means to a child to live in a world without sound cannot fail to be something of a revelation. We find it easy, or think it easy, to imagine what it means to be blind but few hearing people realise how much we depend on sound for interpreting and acting in our environment. How much we take for granted of the sound in our environment and how much learning in general and language in particular depend on efficient hearing is very clearly and vividly described in this book. The personal stories which conclude the book are pathetic yet triumphant; testimonies to the resilience of the human personality. While this is a book which will be read by all concerned with the education of deaf children it should certainly be read by many who are not specialists in deaf education.

One of the basic principles underlying the work of the Ewings is a developmental approach to the education of the deaf and, in particular, the importance of detecting hearing loss and of commencing auditory training as early as possible in babyhood. The earlier that deaf babies can become aware of sound through the use of modern hearing aids the better the prognosis. In one or two centres special clinics are operating at which parents of deaf babies can be advised on the methods of providing the important early stages of auditory training. In fact, the educators of the deaf have managed to break through the school-age-barrier of 5 and have begun to educate from the beginning.

The time cannot surely be longer delayed when something of this sort happens in the case of children who are so mentally handicapped that they are unlikely to be educable even in special schools. One of several gaps in our provision for the mentally handicapped is a system of offering advice and guidance to the parents of young mentally-handicapped children. Wise home training, discipline and experience in the early years may make a considerable difference to their future progress. Parents of normal children are often doubtful and uncertain about how to handle the normal difficulties of childhood; how much greater is the need for guidance and reassurance in the case of children whose physical and chronological maturity are so bewilderingly at variance with their mental, emotional and social maturity. The two booklets on the "trainable" (as distinct from the educable) mentally-handicapped child should prove helpful to parents. Both booklets, one emanating from Australia, the other from New Zealand, explain simply and realistically the nature of subnormality so that parents can both understand their child's limitations and help him to realise his potentialities. The booklet by Professor Schonell, Richardson and McConnel is particularly well supplied with practical suggestions.

Mental deficiency has often been considered an uninteresting and unrewarding subject with the result that the study of it has been left to a few keen workers. Recently there has been a revival of interest both from the medical and psychological point of view. There is so much that needs to be known about the causes of defect, about the possibilities of prevention and about the ways in which the conditions may be treated. As Clarke and Clarke suggest in the book edited by them, mental deficiency is increasingly being appreciated as a rewarding and often exciting field of study.

That this is so is amply demonstrated by the six psychologists and the speech therapist who have co-operated to produce this well-organised survey of the changing outlook in mental deficiency. It is one sign of the changing outlook that such a book should be produced by a group of psychologists. Most of the books on mental deficiency have been written by doctors and have been chiefly concerned with the description of clinical types of deficiency. Books by psychologists have been few, those by Sarason, Wallin and Burt being notable exceptions. The reason for this has been that few psychologists have been engaged in deficiency work, partly because of the shortage of psychologists but partly because of the belief that the psychological study of mental defect was a barren field and that the potentiality of the mental defective for training and therapy was so severely limited. Mental deficiency practice has been mainly concerned with diagnosis and with the provision of custodial and community care. Since the war, however, there has been an increasing number of psychologists working in mental deficiency hospitals and they have contributed to several practical developments as well as initiating research into psychological aspects of deficiency.

The aims of the book are threefold: to summarise the literature on the psychological and social aspects of deficiency; to show the relationship between theory and practice and to show the place of experimental methods; and to give an account of how the learning difficulties and social problems of the subnormal may be ameliorated. The first half of the book is mainly concerned with theoretical considerations. The early chapters on the incidence and classification of mental deficiency and about legal provisions are particularly relevant at the present time in view of the recent report of the Royal Commission on the Law relating to Mental Illness and the passing of the new Act. Two chapters on intelligence have important implications for mental deficiency practice but also are of interest to educationists. A. D. B. Clarke's chapter, "Genetic and Environmental Influences on Intelligence", provides an excellent summary of research. Readers of P. E. Vernon's article in a previous *Educational Review* (Nov. 1958) would find here in much greater detail a critical discussion of some of the research evidence upon which changing views about intelligence are based. There is, for example, a full discussion of Clarke's own findings about improved mental functioning in adolescent and young adult patients which indicated a process of recovery from earlier adverse circumstances. It is a conclusion which gives an impetus to the rehabilitation programmes for high-grade patients described later in the book.

The process of learning in mental defectives and backward children has not received the attention that such an important topic deserves. O'Connor summarises what information there is, drawing upon investigations in Britain, the U.S.A. and Russia, and shows how much more work is needed to lead to firm conclusions for practical application. It is worth noting, however, one preliminary conclusion that while imbeciles are inferior to normals in speed of performance at the beginning of training, they are capable of exceeding expectations based on their intelligence level when they are given long enough to learn with suitable conditions of motivation. Some interesting Russian work by Luria and Leontiev on the rôle of verbalisation in learning is also suggestive of further lines of study.

O'Connor contributes a further chapter assessing the work to date on the psychological effects of brain injury and emphasises the inconclusive state of psychological inquiry in this field. This chapter and the following one on cerebral palsy would be of interest to psychologists and teachers engaged in work with handicapped children.

The second half of the book describes some of the methods of training and therapy now being provided in a number of mental deficiency hospitals. Of particular interest is the account of the training of imbeciles (IQs 25-50) in work such as box making and assembling components in which they have achieved levels of performance much superior to those hitherto believed possible. This important development offers the hope that many imbeciles will in the future be able to engage in useful work rather than be provided with mere occupation. Another aspect of special interest is the account of rehabilitation programmes for feeble-minded patients (average IQ around 70). It is often not generally realised that mental defect can be as much a social as an intellectual defect and that some of the adolescents entering mental deficiency hospitals are the failures of the educational system. Many have been to ESN schools, some have attended ordinary schools and have failed to adjust satisfactorily to life at work and in the community after leaving school. If their problem is not tackled vigorously, they may become permanently institutionalised. One of the valuable contributions of psychologists recently has been the development of intensive rehabilitation programmes enabling more of these patients to be gradually absorbed into the community. The methods of rehabilitating these patients is described in chapters by Dr Gunzburg of Monyhull Hospital, Birmingham. The same author surveys the methods and degree of success achieved in psychological treatment of mental defectives. For a long time, the assumption was made that psychotherapy was ruled out because of the limited intelligence of the subnormal. A considerable body of experiment has shown that psychotherapy is possible and useful with defectives.

Altogether, this is a most valuable book not only for its account of current trends in the treatment of mental deficiency but also for its summaries of research in the various fields. Although there is much in the book which is aimed at the specialist working in mental deficiency hospitals, there is much that is of value to teachers of handicapped children and much that is of general interest to teachers.

Psychology of Exceptional Children and Youth is another survey of the contribution of psychology to the study of handicapped children. The extent to which a physical or mental disability is a handicap depends not merely on the nature of the disability but on many other factors which affect the individual's personal growth. What is the child's attitude to his illness? Does he, for example, think of it in some way as a punishment? How does he react to the situation in which he finds himself? Does he regress, become over-dependent or apathetic or become rebellious and awkward? The attitudes of parents, schoolfellows and the community at large may limit or distort the handicapped child's opportunities for normal psychological growth. Medical treatment, necessary and desirable in itself, may result in long separation from home or segregation from normal playfellows, or impose limitations on the child's activity and experience. Clearly such psychological factors must receive as much attention as purely physical factors so that, in terms of the current watchword, we think of a *child* with a handicap rather than categorising a type of handicapped child. That some of the basic research has been done is evidenced by the appearance of *Psychology of Exceptional Children*. After a stimulating introductory chapter by Meyerson on the "Somatopsychology of Physical Disability, there are chapters devoted to the main groups of handicapped children with a good deal of attention to physical handicaps. The two final chapters summarise American research into the psychology of gifted children and the use of psychotherapy and play techniques with exceptional children. While this is not a book that will appeal to the general reader, it is certainly one which should be known and consulted by anyone who has dealings with the handicapped.

Dr Cleugh's book is a useful critical summary of policy and methods of organisation in the provision of special teaching for educationally subnormal children. While a small proportion of educationally backward children need special schooling, there are many more who need help in special classes, in remedial education centres and in other ways. Dr Cleugh examines some of the problems in the selection of children for special schooling and in the organisation of the special E.S.N. school.

There have been many developments and experiments in ways of providing special teaching in ordinary schools and an assessment of these was due. Dr Cleugh's objective review of these arrangements provides a good basis for further thinking and discussion about this important aspect of education.

R. GULLIFORD

MODERN TRENDS

H. C. DENT, *Secondary Modern Schools* (Routledge and Kegan Paul, London, 1958, 15s.).
R. M. KNEEBONE, *I work in a Secondary Modern School* (Routledge and Kegan Paul, London, 1957, 12s. 6d.).
J. J. B. DEMPSTER, *Purpose in the Modern School* (Methuen, London, 1956, 7s. 6d.).
H. LOUKES, *Secondary Modern* (Harrap, London, 1956, 7s. 6d.).

DURING their first twelve years of life secondary modern schools have had to face many difficulties. That they have now largely overcome these is some measure of their success. Coming into existence overnight by parliamentary decree, without new buildings or adequate numbers of teachers, they have survived in spite of frequent poor press comment, and are now being accorded some degree of recognition.

Last December the government agreed that the most urgent task in education was to provide secondary schools in which a sound and varied secondary education could be offered to all children of secondary school age. This has been the greatest problem for those teaching in the modern schools. For, though most people in 1946 knew what was meant by secondary grammar education, few could define what was meant by secondary education according to a child's age, aptitude and ability. This was what teachers in the modern schools had to discover; how could they give their children an education of secondary school standards in the old buildings and with the out-of-date equipment inherited from the schools when they were of elementary status.

Partly because of these difficulties the modern schools have been compared unfavourably with the grammar schools. Parents wanted their children to go to the grammar schools because of their prestige value, because they seemed to be better equipped and because they seemed to know what they had to teach. As a result of the tremendous amount of thought and experiment that teachers in modern schools have given to their work this antagonistic attitude on the part of parents is gradually declining. In fact we are beginning to see the working out of a miracle. For in the modern schools boys and girls are discovering the joy of work which is a challenge. Families are not as eager as they have been to secure a transfer for their children from a modern to a grammar school. In many cases this has occurred because the modern school, instead of trying to copy the work of the grammar school, has developed schemes of work which have suited their children.

As is to be expected this success of the modern school has begun to attract writers among all sections of educationalists. The authors of the four books named above have had wide and varied experience of teaching and administration. Between them they have looked at many modern schools and at many authorities' schemes for trying to avoid any unfairness in selection for secondary education. Wisely they attempt neither to praise nor to blame what they have discovered, believing that more time is required before any definite verdict can be given on the success or failure of the modern schools. These books, then, contain reports of what is happening in this field of secondary education.

Mr Loukes and his colleagues have tried to discover what is meant by the term "secondary modern". They began by asking such questions as "Is there a secondary modern child?" and passed to "Is there a secondary modern curriculum?" By visiting a number of these schools they have tried to find the answers, and the only answer common to all the investigators was that these schools are educating the adolescents, and by doing that they suggest the schools are preparing their children for life. They have found these schools giving no more and no less a vocational curriculum than do the grammar schools. The emphasis is different. *But their* success can be judged by the sense of purpose which the children acquire. This is stressed by Dr Dempster, who after much investigation writes that a bias towards vocational education in the modern school curriculum is not only respectable and desirable but also advisable. He shows in particular how his own education authority is tackling the problem of the modern school. Without in any way attacking the grammar schools Dr Dempster advocates the development in the modern school of special courses, linked with the requirements of the area in which the school is situated. These two books, by Mr Loukes and Dr Dempster, should be read in that order by every student in training, for they form the starting point of any inquiry about the modern school.

The other two books, by Professor Dent and Mr Kneebone, look inside the modern school in rather more detail. Without perhaps intending it these writers show clearly that the battle for esteem which the modern schools are having to fight is being won. Many children have received great benefits from them; more and more parents are realising that these schools are providing an atmosphere in which their children can develop as individuals. Much, of course, has yet to be done before every modern school is a fit place for education. But, as Mr Kneebone reveals, this can be done in such a way as to win the confidence of parents. He sets out clearly all the wares of the school of which he is headmaster. He fits his curriculum to his children; he proves how false is the statement that if you want to know the difference between grammar and other kinds of schools you have only to see what happens at four o'clock any afternoon. Detractors of modern schools will say this is a picture of a particular school, not in any way representative, but Professor Dent proves, with interesting examples, that many schools are developing their own individuality and providing out of school activities that have in the past been associated in some people's mind only with grammar schools. Above all, these writers are agreed that there is no one type of modern school. In other words children are being educated according to their needs at the moment and for the future.

Although it is true that sound education can be given in out of date buildings there is no doubt that children respond eagerly to the stimulus of new and better surroundings. Mr Kneebone writes attractively of the removal of his school in a northern city from old to new buildings. By challenging his children to work to their capacity he has overcome all hostility, he has many staying later than fifteen and yet his school does not offer any external examination courses. This is perhaps one of the major problems of the modern school to-day. If it can be satisfactorily solved, and figures from the external examining boards seem to prove it can, then much of the attack on 11+ examinations fails. For part of this attack is aimed at the problem of the borderland between those who go to a grammar school and those who do not as a result of the 11 + examination. Many modern schools can choose whether they wish to create an extra year's course in which children can take external examinations. These schools are taking into consideration both the abilities of their children and the desires of parents before deciding. These are successful schools, such as Mr Kneebone's, which satisfy these requirements without external examination courses. Others are successfully introducing them and in these schools there appears to be no feeling among the parents that the modern school is inferior to the grammar school. Again, as Professor Dent illustrates, wherever an education authority has begun extra courses needing a fifth year at school the demand from both children and parents has quickly exceeded the supply, so that everywhere more and more fifth year courses are growing. Perhaps the raising of the statutory school age to sixteen is not after all very far away.

Yet the main purpose of the modern school is to educate the large middle group of the nation's children, the other groups being, roughly, those placed in grammar or technical schools and those placed in special schools. More experiment is needed to discover how children of this middle group learn. Will they learn better by the project, or accumulative, method, as Professor Dent calls it, or will they assimilate knowledge more easily by being taught it in logical development? Here is the real problem for teachers and trainers of teachers.

From the material collected in these four books one has the strong impression that the modern school has come through its early difficulties. It is an impression that is confirmed by experience of local schools. None of the writers attempts to grind an axe. Each states carefully, and with ample illustrations, what he has found in modern schools throughout the country. Both Mr Loukes and Professor Dent stress that theirs are only interim reports. We can await eagerly and with optimism further information about the important work which modern schools are doing, for, though they have largely overcome their early problems, their success has given rise to others.

H. C. HONEYBONE

INDEPENDENT EDUCATION

GEORGE SNOW, *The Public School in the New Age* (Geoffrey Bles, 1959, 12s. 6d.).

THE headmaster of Ardingley College, Sussex, has written a sincere and enthusiastic, and also usefully well-informed, book about the present state of the public schools for boys. Suspecting that Mr Snow was wearing rose-tinted spectacles I prevailed upon an intelligent 18 year-old acquaintance who had just left a famous public school to read the book and give me his opinion. He reported that he thought the book gave a substantially true and fair description, though perhaps it was somewhat optimistic about the amount of freedom that now exists in the public schools. In any case, some allowance must be made for differences between individual schools.

If the "public schools" are taken to be all those represented on the Headmasters' Conference, there are some 180, most of them boarding or partly boarding. If, on the other hand, the term "public school" is reserved for those whose names are well known at least among the sort of people who send their boys to them, the number would not be much over 30. Whichever reckoning is used, the public schools exert a national influence out of proportion to their actual population, partly because of their prestige, but also for the very practical reason that most of their boys stay the whole course and the sixth forms of these schools are numerically much stronger in proportion to the whole school population than in the case of the grammar schools, from which there is still a considerable wastage round about the age of sixteen.

Two important revolutions have taken place in the public schools. One is an economic and social revolution, for which no precise starting date can be given, but which has been notably accelerated in the last 25 years and has brought about a significant change in the clientèle of the public schools. The rise of the modern managerial class on one side, and the increase of school fees on the other, have produced a situation in which rather less than half the boys now in the public schools are sons of men who were themselves at public schools. Not long ago I heard this fact confirmed by the headmaster of a much more famous school than Ardingley, and there can be little doubt that it is fairly general. In these days it is the business executives who can afford to send their boys to public schools, and the professional families, with perhaps a long tradition of public school education, are finding it increasingly difficult to keep up that tradition. Some can pay for it from some remnant of family capital; but increasingly they are being squeezed out.

Mr Snow is not unnaturally interested in the possibilities of easing the situation for those families in which public school education is traditional but which are finding themselves priced out of it. He reminds us that, in the armed forces, a parent who wants to send a child to a boarding school receives £150 a year for the first child, £175 for the second, and £200 for each subsequent child. He also mentions the fact that in Australia (which is accustomed to Labour governments) a parent with dependent children receiving full-time education up to the age of twenty-one is eligible for deduction of Income Tax, to a maximum of £100 a year in respect of fees, school uniform, equipment, books, etc.

Mr Snow is also interested in the extension of public school education to sons of families which have hitherto never been able to afford it. But he points out that the general character of a school is inevitably related to that of the families who support it. You cannot radically change the clientèle of a school and at the same time expect it to remain the same kind of school. He makes the very sound point that the modern public school, with its comparatively generous amount of freedom, responsibility and choice, is complementary to a good home and is by no means a suitable place for boys from insecure, deprived, or broken homes, whom some local education authority has deemed to be in need of a boarding school education. He gives it as the considered opinion of public school headmasters that the public schools could absorb up to a maximum of 25% of "cases of need to board". As to the wider opening of the door to boys from homes that are good but not affluent, one gathers that Mr Snow would welcome any arrangements by which public money could be made available to help parents who want to send their boys to boarding schools.

The other revolution that has taken place in the public schools is a cultural one, dating from the end of World War I. One of the signs of the times was a free-lance magazine published at Rugby in 1918 or 1919 and containing literary efforts and photographs of works of art done for the fun of the thing. About the same time a prefect at another school, where practically nothing at all happened outside the classroom and the games field, asked his headmaster's permission to form a dramatic society. Permission was very firmly refused, though the reasons were not very clear. The reading of plays could be allowed, but no acting. This school now has a well-equipped theatre.

Compared with the conditions prevailing 40 years ago, the public schools of to-day have a much more varied programme of study and more enlightened methods of teaching (to *speak* a foreign language has almost ceased to be an act of audacity in questionable taste). There is a far more varied programme of games. School societies and other spare-time activities abound. Relations between masters and boys are easier and more friendly. Discipline is less authoritarian. And in all kinds of ways there is much more opportunity for boys to exercise free choice.

To the ultimate question: "Is it worth it?" (i.e. is it worth raising upwards of £350 a year to send your boy to a public school while at the same time, through rates and taxes, helping to pay for the education of other people's children?) the only answer must be: "It is worth it if you think it is."

Those who patronise the boarding public schools are certainly not buying ease and comfort for their boys. Compared with the day school boy who has his own room at home, with a comfortable bed, the boarding school boy lives hard, and the rigours of his existence (even though less severe than in the days when there was early school before breakfast all the year round) would not be a bad preparation for polar exploration, life in the armed forces, or a sojourn in one of Her Majesty's prisons. A candidate in an examination for a teaching qualification recently wrote: "To send a boy or girl away from home for months at a time seems inhuman." Conversely it might be suggested that (as many young men found when called up for national service) it is a cruel experience to be sent away from home at 18 if you have never lived away from home before.

What educational advantages can be claimed for the public schools in addition to those already mentioned? First, they are independent, and are not answerable to any public authority for their curriculum, methods, the number of days' holiday in the year, or the number of penholders per head. Then (and this is an important feature) each school has a national catchment area; this means that a variety of experience and interests will be gathered together, and there is likely to be a fair number of boys who, through their fathers, have some insight into various aspects of public life—literary, scientific, political, and so on. Again, the boarding school (whatever its disadvantages may be—and these are certainly less marked than they were 30 or 40 years ago) is a complete and close-knit community which affords more opportunity than the day school ever can for the development of out-of-school activities; evening meetings of societies, or rehearsals of music or drama, present little difficulty.

The public schools are also, for the most part, Christian foundations—some of them denominational. Without in any way detracting from the achievement of many maintained grammar schools in religious education and worship, it may be said that the public school context more readily invites a positive approach to these things. Cynicism about public school religion and the school chapel used to be fashionable. And no doubt religious activity is often perfunctory in the public schools, as it is in a good many other places. Nevertheless, there is reason to believe that religious teaching and worship are very much more alive in these schools to-day than they were thirty years ago. At all events the boys become acquainted with the historic liturgy, adorned by good music; from time to time they hear eminent preachers; they are carefully and intelligently prepared for Confirmation; they are competently taught the Scriptures; and the life of the school affords ample opportunity for discussing the relations between religious belief and the advance of knowledge in other departments of life.

As to the future of the public schools, who is rash enough to prophesy? For the time being the Labour Party propose to leave them alone—partly because they cannot make up their minds what else to do with them, and partly because successful Labour politicians like sending their sons to them.

M. V. C. JEFFREYS

THE TRAGIC VIEW

WILLIAM WALSH, *The Use of Imagination* (Chatto and Windus, London, 1959, 25s.).

The Use of Imagination is a most stimulating book. The very title implies a challenge ("usefulness" being far too often thought of merely in connection with the practical or technological) and the book itself challenges many contemporary assumptions in education, drawing upon literature to do so. Its main concern however is not so much to use literature as illustration for educational themes as to send the student of education back to the great writers; for such a student, as it rightly points out, is not primarily concerned with accumulating information, but with "cultivating personal quality", and of all studies literature is that which "most radically and permanently modifies the grain of his being".

The chapters on Coleridge are good examples of the fine quality of the work. In Chapter One the works and letters of the poet are surveyed for his comments on childhood, which are found to be remarkably perceptive and valuable even for us to-day, who sometimes talk as though childhood were a twentieth-century discovery. He is well used in Professor Walsh's criticisms of, for instance, self-expression in education (one must "prejudice the soil towards roses"), of the abdication of the teacher, of the rationality as conceived in intelligence testing, of the view of children which allows them little common humanity with adults. He is not quite so well used in the criticism of the post-Freudian denial of the innocence of children, which was a belief held by many of the best (and worst) minds of the time: we are not shown that Coleridge was conscious of its implications in the way that Blake, for instance, is in "The Little Vagabond". Normally, however, Professor Walsh's use of evidence is admirable. In Chapter Three Coleridge is again drawn upon. Here the present system of training teachers comes under fire for giving observation primacy over reflection, so that information rather than "reflective self-knowledge" is what the student ends up with. These words are salutory; though the effect of the chapter is to leave one a little doubtful whether the writer makes quite enough allowance for the differences between the mind of Coleridge and that of the usual teacher trainee.

The most fundamental attack upon some modern assumptions, however comes in Chapter Eight. Professor Walsh sees the tradition of literature as one of the few "still active and life-giving" at a time when other traditions are weakening and dissolving. And for him this tradition presents the tragic view of life:

> Tension and conflict, anxiety and guilt, the dramatic form of character, and character set in a tragic universe—to accept these is to acknowledge what in our day so many influences conspire to stain, the peculiar dignity of man. Involved in this acknowledgement are a recognition of the difficulty and complexity of man's situation, and a rejection of the comforting illusion, pervasive and corrupting in education, that a greater accumulation of positive information, a more thorough psychology, a fuller mastery of teaching method, will disperse the painful and incomprehensible in man's predicament and finally pluck the heart out of the mystery.

Not every one will agree completely with these Sophoclean sentiments;

but they give power and coherence to the book. In Chapter Three, we are shown how, with Wordsworth, fear could be, not something to be eliminated at all costs, but a source of growth. Yet in writing of Keats Professor Walsh speaks of the "Ode on a Grecian Urn" "being muddied" by the poet's anxieties. And Coleridge comes to mind as a man whose creative gifts were crippled by his "anxiety and guilt"; he confides to his notebook that he is constantly preyed upon by some "Dread or other in my mind from fear of Pain, or Shame", and it is significant that the only time he comes close to being a great poet is in the period of near happiness at Nether Stowey in 1797 and 1798 under the sane influence of the Wordsworths. The scheme of the book seems to require the consideration of such an apparently contrary case as his, especially since he assumes such an important place in it already.

The discipline recommended in the *Use of Imagination*, if only for the *élite* capable of it, is of course that of literary criticism conducted in "Cambridge school" terms (there is an essay on Leavis, discussed with Arnold and Coleridge). And Professor Walsh gives us some admirable examples of this discipline at work—in for instance his appreciation of the "Grecian Urn" in the essay on Keats. It might perhaps be considered a limitation of the book that it does not stray far outside the Cambridge orthodoxy—Coleridge and Keats, James and Lawrence, Hopkins and Eliot. There are some acute but tantalisingly brief references to "the unexampled force and peculiarity" of the vision of childhood revealed by (the unfashionable) Dickens, but they are not developed.

It would however be ungrateful to carp. Professor Walsh has given so many good things—for example the fine essay on Wordsworth, the chapter on "The Writer and the Child" (including a discerning analysis of the appeal de la Mare has for us), the welcome protest (Chapter Ten) against the contemporary denigration of language, particularly by the philosopher. Above all one is grateful for the conviction and idealism of the book; it is an inspiration to all concerned with literature and with education.

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E. A. PEEL
H. J. HALLWORTH
A. M. WILKINSON

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THE TRANSFER OF TRAINING

by CYRIL BURT

1. The Theories

"At my preparatory school I was made to memorise long extracts from the English poets, and, though I have forgotten every line, the exercise both strengthened my memory and sharpened my imagination; at my second school my struggles with Euclid and algebra trained my powers of reasoning, Latin and Greek my powers of thought and speech, and the lessons in natural history my ability to observe. Had my mental faculties never been practised in this way, I could have no more coped with the problems of later life than I could have withstood the physical strains of war had my body not been trained in the school gymnasium and on the football field."

These sentences, culled from a memorandum submitted by an "eminent headmaster" to the Board of Education's Consultative Committee twenty years ago, put into concrete terms the opinion still held by many parents and teachers at the present day. It is the doctrine summed up still more tersely by the sententious Mr Stelling, Tom Tulliver's tutor in *The Mill on the Floss*: "The classics and geometry provide that general culture of the mind which will prepare it for the growth of any subsequent crop." We know the effect on poor Tom; it was echoed in his nightly prayer: "And please make Mr Stelling say, I shan't do Latin any more. Amen."

The memoranda submitted by the psychologists differed widely, not only from the conclusions of the "eminent headmaster", but also from each other; and the profound divergences between their several views have proved extremely disconcerting to the practical teacher. The choice of subjects to be taught, the content of the curriculum, the aims and methods of instruction, the type of exercises to be set the pupils—all such questions must very largely be decided by our preconceived notions as to the degree in which whatever is learnt will be carried over to the situations of after-life. And so let us begin by glancing at each of the alternative theories in turn, and then examine the evidence available in their support.

1. *The Faculty Theory*. Down to about a hundred years ago the majority of psychologists still subscribed to the venerable theory of mental faculties. The most familiar version is that popularised by the phrenologists of the early nineteenth century. Just as the body consists of a number of limbs or members, so, it was argued, the mind consists of a number of faculties or powers, and the brain of corresponding "organs"; and, just as exercises with Indian clubs or dumb-bells strengthen the child's muscles, so, it was said, by exercising the appropriate faculty or "organ" you can train the child to observe, to remember, or to reason. And so, long after the vernacular had replaced Latin as the language of science and the humanities, psychologists as well as educationists still assigned to the classics the same pre-eminent place in the school curriculum that the Reverend Mr Stelling accorded it, on the ground that "no other subject could equal it as an instrument of training the intellectual faculties" (1).

2. *The Associationist Theory*. This naïve notion of the working of the mind and brain was at length discredited by the arguments of the British associationists, which in turn were quickly reinforced by the early discoveries of the physiologists. As their microscopical studies revealed, the brain consists, not of distinguishable organs, but of nerve-cells connected into a systematic network by numerous nerve-fibres. Hughlings Jackson pictured the brain as a hierarchical organisation of nerve-circuits connecting stimulus and response—of so-called "reflex-arcs", the simplest already functioning at birth, while the more complex were acquired by a process of association during the individual's lifetime. Thus, when the child learns some new fact ("William the Conqueror—1066") or some novel act of skill, what really happens, so it was held, is that the learning process opens up a new nerve-channel leading from one group of cells to another. It would seem to follow that the effects of learning must be highly specific. To practise one set of connections by memorising a poem could no more affect your power to memorise a different set of connections—the multiplication table or the dates of history—than opening up a new line from Bristol to Birmingham would make it easier to travel from London to Leeds. In the end Professor Thorndike and his co-workers resolved to put the issue to the test of actual experiment. As a result he was led to enunciate his celebrated theory of "common elements": "training in one task improves performance at another only so far as the two have identical elements in common" (2). In Britain, its original home, the associationist school

with its over-simplified theories gradually succumbed to the attacks of philosophical psychologists like Ward and Stout. In Russia, however, it was taken up afresh by Pavlov, and re-formulated as the doctrine of conditioned reflexes; while in America it was energetically championed by Watson and the behaviourists, and thus given a new lease of life.

3. *The Theory of Generalisation.* The psychology of the associationists was essentially a structural psychology: it conceived the psychologist's main task as the study of mental structure and of the elements of which that structure is composed. Its chief American critics—Dewey, Angell, Judd, and their co-workers in Chicago—advocated in its place a functional psychology: for them the primary task of the psychologist was the study of mental operations. Association was held to be but one of many types of mental process—chiefly characteristic of the lower levels of conscious life; the higher levels—those distinctive of man, it was maintained—involve "processes of a subtler kind, commonly described as 'rational', notably the processes of generalisation and inference". This functional theory was applied by Judd to the problems of formal training. In his view "genuine instances of transfer (when not merely instances of logical inference) are the effect of generalisation. . . . Transfer takes place only to the extent that the individual *generalises* what he learns" (3). Mrs Malaprop was an early advocate of this mode of instruction: to improve the style of poor Lydia's speech and correspondence she begged Sir Anthony "to train her above all in general orthodoxy that she may not misspell and mispronounce so shamefully as other girls do". And in terms equally emphatic, Professor Angell assures us that "generalisation is the one true form of learning".

2. The Essential Facts

In the face of these divergent views the first question to settle is obviously this: does anything which can fairly be called "transfer of training" really take place, and, if so, to what extent? We may summarise the chief experimental results as follows (4).

1. In spite of the sceptical conclusions reached by many of the earliest investigators, no psychologists to-day would doubt that something like a "transfer of training" *may* occur. But sometimes the effects may be harmful rather than helpful: they can indeed seriously interfere with the child's efficiency in the subsequent task. In a survey of the numerous researches carried out during the first 35 years of the present century it was found that 76% reported some

degree of positive transfer, 10% reported negative transfer, and the remainder disclosed no demonstrable effect either one way or another (5).

2. In general, indirect training (i.e. attempting to improve performance in one task by practice at another) proves to be far less effective than direct training; and its influence varies widely in amount. Putting the improvement achieved by direct training equal to 100% that of indirect training may range from +30% (or slightly more) down to −10%. Roughly speaking, direct training is from 3 to 20 times as efficacious, according to the nature of the task.

3. There is no evidence whatever to show that a given mental function is automatically strengthened by exercise as the faculty psychologists maintained. The commonest instance cited by teachers is that of memory-training. There can be no doubt that children who have been drilled in memorising one kind of subject (poems, tables, or even nonsense-syllables) may as a result improve in their ability to memorise other subjects (dates, formulae, passages of prose, or vice versa). But what actually happens is that, during the practice, many of the children improve not their memories but their methods of memorisation: they hit on helpful devices, they acquire greater confidence, in short, they learn how to learn. There is no all-round improvement in any faculty or general factor for retention (6).

4. Both the theory of common or identical elements and the theory of generalisation appear to be partly confirmed by an analysis of the experimental results. Yet there are many cases to which they do not apply, at least when interpreted in the sense intended by their authors. To some extent both explanations are little more than tautologies. If my watch disappears and another watch is discovered in a suspect's pocket, I cannot allege transference, unless the watch that vanished and the watch that is found are identical; yet unless some elements in the two situations are dissimilar, we cannot speak of transfer. If therefore certain of the features that formed "elements" in the practice-situation reappear in a slightly different context when the results of the practice are "transferred", then we might just as well say that those elements have in some sense been "generalised": indeed, to declare that a characteristic is "common" to two situations is really to say that the characteristic is "general". Nor does the mere presence of similar elements necessarily guarantee transfer. Accordingly, since the processes with which we are concerned are not physical processes, but conscious processes, several writers have

suggested that the elements common to the two situations should be re-interpreted to mean common *conscious* elements. Yet a pupil may be fully conscious of a rule or precept, and still fail to recognise its relevance to the new problem which later confronts him, even on the same day, e.g. as part of his homework. Godfrey Thomson therefore went further still: not only the elements but also the process must be brought to the pupil's notice. But if this were a *sine qua non*, it would preclude all possibility of *unconscious* training or transfer (7).

The fact is that no theory so far put forward will suffice to cover all the facts of transfer or its absence (8). The processes involved seem to be different in different cases. For the teacher therefore the crucial question is really this: what in any given instance are the particular conditions which will not only render transfer possible, but will maximise its amount.

3. THE CONDITIONS OF TRANSFER

(*a*) *Conditions in the Learner.* On the side of the learner, the most important factor is the learner's "intelligence", i.e., his inborn, general, cognitive ability. The dullest—those formerly called educable defectives—can do little more than learn specific automatic habits; the moderately dull manage best when taught a small number of simple and well-practised rules with clear indications as to the field of application; the brightest are not only capable of understanding a variety of highly abstract principles and of applying them spontaneously, but show a ready capacity for incidental learning and implicit generalisation.

In addition to general intelligence, special abilities—linguistic, mathematical, technical, or artistic—no doubt play an appreciable part; but about their operation little is known. On the conative side temperamental and motivational factors are of supreme importance, in this as in every type of learning. Generally speaking, training is most effective when the work is of such a nature as to appeal to the interest and enterprise of the learner, and of sufficient difficulty to tax his powers of concentration and persistence and confer a glow of satisfaction when success is at length achieved; yet the problem to be solved must not be so hard as to engender more failure than success or to be positively unpleasant and fatiguing. Dominie Dougall's favourite maxim that "discipline is not discipline unless it is distasteful" is based on a plain psychological fallacy.

(*b*) *Conditions in the Task.* As regards the task itself, the most obvious outcome of the experimental studies, taken as a whole, is that transfer depends far more on similarity of mental *content* than on similarity of mental *process*. Learning to observe the characteristics of plants or animals will not help you to observe the characteristics of buildings or machines: reasoning about geometrical figures will not help you to reason about historical events or political problems. On the other hand, practice in addition improves the child's efforts at long multiplication because long multiplication involves a knowledge of the addition table (9). Similarly the study of Latin is of value to those who go on to learn French, Italian, or Spanish, because the vocabulary and grammar are so closely allied; it is of little or no value in learning languages like Russian or Hebrew which have little or nothing in common with Latin (10).

Let us therefore begin by inquiring what types of mental content appear to mediate the transfer of training, and which of them yields the most satisfactory results.

Transferable Contents

1. *Perceptual Elements*. The earliest experiments were carried out chiefly with the simplest forms of sense-perception—visual, auditory, and kinaesthetic—such as were usually studied in the psychological laboratories of those days. In one of the earliest of all, the learners were practised in discriminating the size of certain outline drawings all of the same shape (e.g. rectangles), and this was found to produce an appreciable improvement in discriminating the size of similar figures, so long as the size alone was altered and not the shape; it had little or no effect on discrimination of size with other shapes (e.g. triangles). Similarly practice in visual discrimination (e.g. of colours) had no effect on auditory or kinaesthetic discrimination (e.g. of musical sounds or of the weights of loaded boxes (11).

These and many later experiments of an analogous type clearly refute the possibility of what teachers used to call "sense-training"—the motion that you can develop a capacity for *general* observation by methods such as those described in *Eyes and No Eyes* or the popular boy scouts' manual: we all remember how Johnnie Goggles was marked down by the scoutmaster as "unobservant" because he could not say how many steps led up to his bedroom, or at which end a recumbent cow begins to rise. Efficient observation depends primarily on knowing what things to look for; and significant items are common only to a very narrow range of activities. Every farmer's son could answer the question about a cow; only an architect or a purchaser of property would count the steps in every house he entered.

For the same reason the phonetician's exercises in "ear-training" do not really train the ear: they merely give the listener opportunities to observe more closely the finer audible differences, to store mental images of typical sounds, to pin down the characteristics of each one with their appropriate technical names or a convenient set of symbols. The cultivation of the powers of observation is therefore a much more intricate affair than most educationists have hitherto supposed.

2. *Motor Elements*. Later experiments similarly showed that, once they had been learnt, specific muscular actions could usually be transferred as complete units; but there is no general faculty of manual skill capable of being improved by automatic exercise. Teachers giving instruction in typewriting report that pupils who are skilled pianists quickly make good typists because they have already learnt to move the third and fourth fingers of both hands separately with graded force. Nevertheless, the results of such transfer are not always beneficial, but often the reverse: those who are accustomed to the piano, for instance, always find it difficult to learn the organ because they still tend to strike the keys instead of pressing them.

Here experimental research has thrown into sharp relief a curious phenomenon. It appears that learning to make an old reaction in response to a new sensory percept is usually accompanied by positive transfer, whereas learning to make a new reaction to an old sensory percept is usually accompanied by negative transfer (12). If, as a boy, you have habitually kept your loose change in your right-hand trouser pocket, you will have no difficulty in searching for your latch-key in the same pocket later on; but if, owing to a hole in the usual receptacle, you put your money in the left, you will find it doubly difficult to form the requisite habit with your left hand. In the classroom perhaps the most conspicuous instances of this type of interference are those observable in speech movements: a Frenchman tends to speak English with pure vowels, uvular r's, and equal accentuation on every syllable; and similarly a London pupil inevitably carries over into French the diphthongal vowels of Southern English. It is a commonplace that children pick up a foreign accent best when very young. The popular explanation is that, as they grow older, "their muscles set and stiffen". But this assumption is quite wrong. The real reason is that, as soon as they begin to talk clearly, children develop stereotyped habits of pronunciation which interfere with the acquisition of different movements of the lips and tongue.

3. *Associations*. Most of what we learn, however, consists neither of simple perceptual elements nor yet of unitary motor reactions, but of connections linking the two. Habitual associations of this kind are often transferred quite mechanically. A lad who has learnt to keep his eye on the ball at cricket tends automatically to do the same when he starts learning to return the ball at tennis. If in the Latin class the schoolboy has learnt to say "earth" whenever he sees the word *terra*, this association will come to mind when he sees the word *terre* in French, or when his eye lights on some technical term derived from the same root, such as "terrestrial"; and, like "Young Ginger" in Ian Hay's story, he may be tempted to declare that "terrific" means "something which fixes you to the earth with fright" —an inappropriate transfer of two mechanical associations.

4. *Ideas*. Perhaps the commonest types of mental content to be re-applied in novel situations are those which we loosely call "ideas". The simplest instance of a transferable "idea" is the so-called "mental image"; and a "mental image" might itself be described as a transferred sensation. When a youngster, brought up in the city streets, has been taken on his first excursion to the seaside or the country, he returns with a vivid fund of mental pictures, which enable him to understand what is meant by a "river", an "island", the "coast", and other unfamiliar terms that he hears in his lessons on geography. And a good visualiser can transfer his visual images to paper like a landscape artist, or evoke them to interpret what he cannot see in detail. Much of what is called "training in observation" consists in stocking the mind with preparatory "ideas"—that is, mental "images", usually with their associated names—indicating in advance the specific points the observer needs to recognise.

But the most important ideas that we reapply in this way are those more complex notions which, if rendered explicit, would have to be expressed in whole sentences—generalisations, principles and precepts, recipes and rules-of-thumb. In an early experiment on learning (13) I practised children in tracing geometrical patterns as seen in a mirror in order to determine how far such practice increased the child's ability to draw different patterns or even the same pattern with the other hand: it appeared that the duller children proceed by trial and error, and show little or no transfer; the brightest often hit upon some such guiding maxim as that "right and left movements are not reversed, but movements towards and from the mirror must be reversed"; and its application is immediately followed by a marked improvement. Judd noted a similar tendency in training boys to hit targets under water: those did best who had been instructed in the general principles of refraction. It was indeed results such as these that drove him to formulate his "theory of generalisation" in order to explain the facts of transfer. Nevertheless, as ordinarily stated, that theory seems just as inadequate as the rest, since it fails to account for those cases in which transfer occurs, even when the learner has made no overt generalisation (14).

5. *Relations*. The defects of all these earlier theories, particularly those advanced by American experimentalists like Thorndike and Judd, appear to spring from their oversimplified notions of the workings of the mind: they recognise no mental contents except explicit sensory contents (i.e., sensations and their images, together with the more complex percepts and ideas formed by combining them) and the mechanical associations that connect them. Stout and his followers modified this rather naïve notion, and added two new types of content—relations and schemata. Both play a far more vital role in transfer than any of the simpler types of "common element" we have so far discussed (15).

The older psychologists regarded the mind as operating on a press-button system: learning was treated as if it consisted solely in forming certain memories or habits by mechanical association, much as the electrician lays down bell-wires from one room to another. But with the more intelligent pupil, as a few experiments will quickly prove, learning frequently takes a far more subtle form than this: it includes not merely the capacity to recall specific associations mechanically acquired, but also the power to observe the *nature* of those associations during the process of learning, and to apply what has been learnt to relatively fresh situations with new and appropriate adjustments. Seeing a family photograph in an old-fashioned album a child of six decided to draw top hats on the head of each member; the only silk hats he has seen are seven inches high, but these he draws are all reduced to the scale of the portraits; moreover he puts a large top hat on the father and a tiny one on the baby. The earliest writer to remark on this adaptive behaviour was Thomas Brown: he contrasted "simple suggestion"—the suggestion of the same old idea by mechanical association—with "relative (i.e., relational) suggestion" —the suggestion of a novel idea by a kind of analogy. Spencer developed the doctrine; and Stout discussed it in some detail under the name of "proportional" or "analogical reproduction".

The process is so typical of the intelligent child that I once ventured to make it the basis of an intelligence test. The examinee is given questions of the following type:

1. Prince *is to* Princess *as* Baron *is to* . . . ?
2. January *is to* February *as* Monday *is to* . . . ?
3. Good *is to* Bad *as* Right *is to* . . . ?

Introspection shows that different children tackle such problems in different ways. The "analytic" type of child explicitly notes the relation ("Bad is the opposite of good: what is the opposite of right?") Others, of a "synthetic" type yet equally intelligent, solve the problem, as it were, intuitively—by general impression rather than explicit analysis. Some psychologists, particularly those whose studies have been carried out principally on university students, recognise only the analytic procedure. Spearman, who rechristened it "the eduction of correlates", made it one of his three fundamental cognitive principles, and maintained that it is always preceded by the second of his basic processes—a conscious "eduction of relations". This seems very questionable. Mary's father, in his tenor voice, sings out "John-nie", dropping from *C* to *A*; Mary with her treble voice echoes the call, but transposes it to a higher key—her sing-song dropping from *D* to *B*. She certainly does not, as a professional musician might do, first consciously "educe" the musical relation and recognise it as a minor third, and then apply the relation to the new context, and so "educe a correlate" in the key of B minor. She transposes the interval quite mechanically.

6. *Schemes*. Mary, however, is capable of far more intricate feats than this. Suppose father sings a snatch of a tune: | **d** : **d** : **r** | **t** : - : **d** : **r** | . . . Mary after hearing that phrase only once, can reproduce it exactly, but again she adapts it to a higher key within her own treble register. Here she responds, not with a single pair of associated notes, but with a complex musical pattern. In this case the "elements" reproduced are not "identical". The scheme is the same; but as a result of the transference every note is raised to a higher pitch. Precisely the same type of process may take place when the scheme is logical or grammatical rather than musical. I have heard a teacher require his class to master the tenses of German irregular verbs by learning such formulae as "verbs containing *en* in the root change *e* into *a* in the imperfect and past participle". Yet a pupil, taught by the "direct method", with no knowledge whatever of the underlying rule, can achieve what is wanted because

he has, ringing as it were in his mind's ear a tune like "*Ich kenne ihn; ich habe ihn gekannt*", and can automatically transform it to "*Ich nenne ihn; ich habe ihn genannt*".

A mother says to her four-year-old daughter: "Tell Jimmy that if he isn't a better boy tomorrow I shan't let him go to his auntie's for tea." The next day the child says to the boy: "Mummy said I was to tell you that if you weren't a better boy today you shouldn't go to your auntie's for tea." Consider how many abstract formulae would be required to express the readjustments in the pronouns, adverbs, and tenses or persons of the verbs. It would be absurd to suggest that the girl had "educed" or consciously "generalised" the principles she was obeying, and almost as difficult to explain the carry-over in terms of "identical elements". Few people who are able to spell irregular words correctly have ever explicitly formulated the innumerable rules that govern our orthography; it is rather the poor spellers who like to fall back on explicit precepts such as "*i* before *e* except after *c*". Long ago you learnt to sign your name with a pen, using the tiny muscles of the wrist and fingers: now go to the blackboard, and sign in chalk with upright letters six inches high. You employ a wholly different set of muscles; and yet, though you may have never written in that way before, the magnified signature will, on the very first occasion, display the same distinctive pattern.

In all these instances we may discern typical cases of what is popularly known as "incidental learning"; and in many of them, it appears, the guiding schemes consist, not merely of complex ways of organising sensory contents, but of complex ways of organising our conscious or half-conscious actions. Indeed whether at school or at the university by far the most useful of the "transferable contents" that we thus acquire are methods of procedure. And this suggests a clue to the apparent training of such "faculties" as reasoning, which both science and the humaner subjects, when appropriately taught, can be made to supply.

Of all the mental powers with which man is said to be endowed reason is by common consent the highest and the most far-reaching. Yet, as numerous investigations have abundantly shown (16), reasoning is not so much a faculty as a teachable technique. From the days of Aristotle onwards attempts have been made to analyse and formulate the abstract structures exhibited by the main types of logical inference. Such schemes were sedulously taught and practised by the schoolmen; and the result was a remarkable clarity and cogency in their mode of reasoning. If, therefore, we want the growing generation to think critically and argue convincingly, we should teach them, by suitable exercises rather than by formal lessons on logic, the generalised schemes and procedures essential to all valid reasoning: we should show them how to frame the questions they seek to answer, how to define their terms, state their hypotheses, and set out inductive or deductive arguments without slipping into innumerable traps and fallacies that beset the ill-trained disputant.

7. *Emotional Attitudes.* But of all the various types of mental content that can get transferred from an old situation to a new, the commonest—and the most elusive—are not the purely intellectual systems taught as part of the school curriculum, but the underlying emotional systems, or rather the mixed systems consisting of intellectual notions coloured and intensified by emotional reactions. With younger children these emotional "attitudes" or "sets" are acquired incidentally and operate unconsciously. The most striking instances are what the psychoanalysts call "complexes": as everyone knows, these easily get transferred, often with disastrous consequences. Thus, if with some lingering notion of "disciplining" his pupils' minds, the teacher deliberately sets them tasks which are arduous and disheartening, at which they toil in a state of constant fear, those baneful associations will linger on and affect their later attitudes to the whole of the subject so taught. Like Byron, after his bitter struggles with Horace and Virgil at Harrow, they

> Loathe
> Too much, to conquer for the poet's sake,
> The drill'd dull lessons; and, though Time may teach
> The mind to meditate what thus it learned,
> No longer can it relish as it should,
> But what it then detested, still abhors.

As the child grows older, its emotional systems begin to operate at a higher and more conscious level. He can then build up what are technically known as "interests" or "sentiments". Of these the most effective are what we can call ideals. The supreme importance of implanting sound educational ideals is attested, not only by our own everyday experience as teachers, but also by the results of actual experiments. At an educational conference two investigators read papers on the transference of accuracy and neatness. The first explained how he practised his pupils day after day in habits of neat and accurate work in arithmetic, marking everything that was slipshod or untidy, and insisting that careless exercises should be written out afresh. The result was a marked improvement in arithmetical work, but no discernible transfer to other subjects. The second psychologist reported exactly the opposite: neatness and accuracy were appreciably improved in *every* subject. When fuller details were elicited, it was found that, whereas the first investigator had been content with automatic daily exercise, the second had prefaced his experiment by a "pep-talk" on the value of neatness and accuracy in after-life, and had striven throughout the term to inspire a keen enthusiasm for such ideals, urging his pupils to vie with each other in their achievements, and to take a conscious pride in the results. He had thus inculcated an explicit emotional "sentiment" for the virtues which he sought to instil; and sentiments of that type, when acquired in one sphere, nearly always spread to others.

c. Conditions in the Method of Teaching. From the foregoing review it seems evident that the process of "transfer" is far more complex and far more diversified than is generally assumed. Indeed, the hackneyed term "transfer of training" really embraces a wide variety of psychological phenomena, each of which requires to be studied in and for itself.

1. *Training Specific Activities.* To begin with we may agree that the traditional notion that specific mental functions are improved automatically by sheer reiterated exercise is quite fallacious. No doubt, some teachers will retort: "I have regularly practised my pupils' memories (or reasoning powers, or whatever it may be), and I *know* they improve." In such cases, however, a little investigation will usually show that the training has operated, not directly by dint of simple practice, but indirectly by giving the children ample opportunities for hammering out better methods of work. Indeed, had the teacher himself deliberately recommended these more efficient procedures, the improvement would have been more rapid and still more striking. This in turn implies that the teacher needs to know more about the psychological nature of the various mental processes he is trying to induce in his pupils, and, in the light of that knowledge, should deliberately teach them how to observe, how to memorise, and how to reason.

2. *Conscious Generalisation.* There can be no question that in many instances the conscious and explicit formulation of schemes and principles will, with the more intelligent, greatly assist transfer. "Verbalisation" (as the psychologist somewhat inelegantly terms it) is here of the greatest service: any new mental content that is defi-

nitely pinned down by a clear-cut name or phrase is thereby inevitably generalised. Nevertheless, as we have seen, generalisation, though helpful, is neither a necessary nor a sufficient condition. There are many less familiar and less obvious tutorial devices that the teacher can profitably exploit.

3. *Similarity between situations.* Practically all the relevant researches agree on one instructive point. Other things being equal, the amount of transfer increases according to the degree to which the situation in which the activity is practised resembles the situation in which it is to be applied. *Omnis cognitio fit*, said the old scholastics, *per assimilationem cogniti et cognoscentis*. In the classroom, therefore, the teacher must set tasks and devise exercises which, so far as possible, are suggestive of the problems of real life. Arithmetic should be taught in connexion with such practical transactions as buying and furnishing a house, shopping for everyday needs, budgetting an income, and the like; science, in connexion with the working and repair of bicycles, motor-cars, radio-sets, and the ordinary electrical installations of the home. And generally the units of study should be organised around concrete projects or lifelike undertakings such as the children themselves will encounter when they are grown up. In every case attention should be expressly directed to similarities between the problems of the classroom and the problems of later life and to the analogous methods of attacking both. Even the pupil's attitude towards his problem should, so far as practicable, be the same in the two cases: he will have to discover the right method for himself in the later application; let him therefore discover it for himself in the very first instance.

4. *Isolation of the Transferable Components.* In spite of all these efforts, it will be often found that the transferable principles or schemes do in fact fail to transfer, even to similar problems arising in the very next lesson let alone those of after-life. What then is the further factor that mediates transfer when it occurs? Briefly, I suggest, the secret is this: the essential condition is not so much that the scheme as such should be brought to the surface of consciousness, but rather that it should be able to *shake itself free* of its temporary setting. That in turn is most likely to happen when it appears and reappears in different settings. As James observes, "even a polyp, drifting from one weedy hollow to another, would become a conceptual thinker if a feeling of 'Hullo! Thingumabob again!' ever flitted through its mind." Meeting the same "thingumabob" time after time in precisely the same old context makes for *mechanical*

association; meeting it continually in novel contexts makes for *transferable* associations.

5. *Well-Spaced Repetitions.* But how soon should these subsequent encounters be arranged—while the first is still fresh in the pupil's mind, or after it has been all but forgotten? Experiments undertaken to study effects on transfer of the length of time that elapses between successive efforts have produced rather surprising results. It appears that, if we interpolate an appreciable gap between the earlier exercise and the later, the amount of transfer is, in general, actually increased (17). Moreover, when there is yet a further time interval between the training and the test of transfer, the mechanical associations tend to become feebler, but the transferable associations often seem stronger: there is a marked decline in the memory for the particular items directly learned and directly tested, but comparatively little loss in what has been indirectly learned, i.e., in the *transferable* items—the general schemes, the general principles, and the general methods of procedure. This suggests that a sound policy for the teacher is to revert to the matter taught, not immediately, but after a considerable interval, and then make the further work not just a duplicate of the same old exercise but an active test of reapplication in a different field.

6. *Motivation.* Finally, an indispensable prerequisite is an adequate and appropriate motivation. It is not sufficient merely to teach our pupils how to read and listen critically, how to make accurate observations in this subject or in that, or how to argue logically according to a systematic and rational plan: we must at the same time make them passionately eager to become critical readers, first-rate observers, and cautious and cogent reasoners. The ideal as well as the technique must be firmly implanted. In such cases, what is really transferred is not so much the particular activity practised, but rather the end or purpose at which that activity was directed. And in this sense we may, I think, readily endorse the dictum of the greatest of all school inspectors, Matthew Arnold: "The aim of education is not intellectual discipline or the storing of the mind with facts, but the cultivation of a rational and enlightened outlook on all our multifarious tasks both as individuals and as citizens, in a word of culture: it is something that cannot be assessed by any examination; and, when all the facts and figures and rules have been forgotten, it is the one thing that will remain with us, and linger on to enlarge and humanise our lives." In short 'tis better to have learnt and lost than never to have learnt at all.

NOTES AND REFERENCES

1. Report of Prime Minister's Committee on *The Classics in Education* (1921), pp. 119f; cf. Valentine, C. W., *Latin; its Place and Value in Education* (1935).
2. Thorndike, E. L., *Educational Psychology: Briefer Course* (1916), ch. XVIII.
3. Judd, C. H., *Education as the Cultivation of the Higher Mental Processes* (1936).
4. For the ordinary reader perhaps the best summary of the experimental evidence is that given with a full list of references by McGeoch, J. A., *The Psychology of Human Learning* (1942), ch. X.
5. Orata, P. T., *Mathematics Teacher*, XXVIII (1935), pp. 267f.
6. Sleight, W. G., "Memory and Formal Training", *Brit. J. Psychol.*, IV (1911), pp. 386-457. When children were given explicit instruction on how to memorise they evinced much more improvement than those who had merely carried out daily exercises in memorisation: cf. Woodrow, H., *J. Educ. Psychol.*, XVIII (1927), pp. 159-172.
7. Much of the discussion about the nature of transfer is apt to become purely verbal. Pavlov found that a dog trained to salivate on hearing a note of 800 v.d. would subsequently salivate on hearing a note of 825 v.d. To us the two notes would sound different, and we might be tempted to describe the result as exemplifying transfer. To the dog they may have sounded just the same: and in that case it would be more natural to say that the dog has merely been trained to react to notes of high pitch. However, the probability of the later reaction is found to vary with the similarity between the two stimuli. Pavlov himself, therefore, described the phenomenon as sensory *generalisation*. Many physiologists hold that notes of similar pitch do in part stimulate identical receptor-cells within the ear, and presumably in the dog's brain. If so, we could describe the result as due to the *common elements*. However, until we have secured a fuller knowledge about the underlying nervous mechanisms, most "theories" are bound to be descriptive rather than explanatory.
8. A suggestive criticism of text-book theories will be found in G. W. Allport's *Personality* (1938), ch. X.
9. For an excellent summary of experiments on transfer in the commoner subjects of the primary and secondary curricula see Kingsley, H. L., *The Nature and Conditions of Learning* (1946), pp. 543-550. The main result is that investigations on transfer in school subjects as taught in the classroom bear out the general conclusions drawn from experiments with more artificial tasks carried out in the laboratory.
10. Cf. Kirby, T. J., "Latin as a Preparation for French", *School and Society*, XVIII (1923), pp. 563-569; Cole, L. T. E., "Latin as a Preparation for French and Spanish", ibid., XIX, 1924, pp. 618-22.
11. Thorndike, E. L., and Woodworth, R. S., *Psychol. Rev.*, VIII (1901), pp. 247-261, 384-395, 553-564.

12. Cf. Yum, K. S., "An Experimental Test of the Law of Assimilation", *J. Exp. Psychol.*, XIV (1931), pp. 68-82; Bruce, R. W., "Conditions of Transfer of Training", ibid., XVI (1933), pp. 343-361.
13. Burt, C. , *Brit. J. Psychol.*, III (1909), pp. 145f.
14. Judd, C. H., *Education or the Cultivation of Higher Mental Processes* (1936); cf. also Hendrickson, G., and Schroeder, W. H., *J. Educ. Psychol.*, XXXII (1941), pp. 205-213.
15. The arguments in this and the following section were set out a little more fully in the *Report on Formal Training* which I prepared for the education section of the British Association (*Annual Report* (1930), pp. 608f).
16. Cf. Winch, W. H., "The Transfer of Improvement in Reasoning in School Children", *Brit. J. Psychol.*, XIII (1913), pp. 370-381; Barlow, M. C., "Transfer of Training in Reasoning", *J. Educ. Psychol.*, XVII (1936), pp. 425-430.
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FREUD AND EDUCATION (I)

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PART II

Implicit in Freud's concern for "education to reality", his aim to strengthen the ego as a matter of therapy, there lurks a moral ideal. As A. C. MacIntyre puts it:

> Freud's whole recognition of unconscious purposes is a discovery that men are more, and not less, rational than we thought they were. His whole method of treatment rests on an assertion that men can face and cope with their situation rationally, if only they are given the opportunity. Freud himself helps to conceal this from us by his vehement disavowal of any moralistic purpose in his work. Nonetheless he promotes a moral ideal for which rationally is central. (*The Unconscious*).

It is interesting, nevertheless, to note how often Freud denied a *specifically* moral aim, in the sense that he was unwilling to recommend any *specific* course of action to patients. Indeed, a course of therapy often assumes an atmosphere of complete permissiveness. "We are not reformers; . . . we are merely observers," was Freud's way of putting it. In his *Introductory Lectures*, he urges that

> . . . you are quite misinformed if you imagine that advice and guidance concerning conduct in life forms an integral part of the analytic method. On the contrary, as far as possible, we refrain from playing the part of mentor; we want nothing better than that the patient should find his own solutions for himself.

At the same time, it is as well to remember that, however permissive the analytic situation may seem to be, the very meeting of doctor and patient implies an inequality or roles, and an orientation of the patient to the analyst of a qualitatively different nature from that of the analyst to the patient. The analyst's authority is not less real for being indirect; and, as I have noted before, the analytic pact implies a moral aim of increased rationality, a conquest of ego over id. It is not surprising, then, to find Freud himself referring on one occasion, to psycho-analytic treatment as a "kind of re-education".

The introduction of the pedagogic note, however faint an echo of the true educative situation is thus invoked, provides an opportunity to turn from an examination of the Freudian "experience" to consider the implications of Freudian meta-psychology for education proper. And no more suitable theme could be taken than that of consideration of the relative roles of teacher and therapist. For it will enable us to make discriminations relevant to other aspects of Freud's work.

At first sight, superficially, there would appear to be a certain overlapping of roles. At the very least the aims of both would seem to be partly moral, and rationalistic. Yet, at the moment, when the traditional pedagogic and scholastic role of the teacher is under attack, and the nature of traditional educational aims and purposes is coming to be called into question because of the superior claims, as some would consider it, of mental health, it seems important to press the assessment of the relative roles further.

A crucial point would seem to arise from the admitted affective influence on intellectual life, an influence which, as we have seen, Freud has emphasised. The teacher, it is plausibly argued, cannot now confine his role simply to that of "teaching" in the way in which the role was traditionally conceived. The forces of affective life hidden in the id, manifesting themselves as unconscious motivations, may not only interrupt the children's powers of learning and concentration; they may even influence the teacher himself in ways of which (naturally) he is not aware. As Freud, addressing the ego, puts it:

> In all cases . . . the news that reaches your consciousness is incomplete and often not to be relied on . . . Even if you are not ill, who can tell all that is stirring in your mind of which you know nothing or are falsely informed. (*Collected Papers* Vol. IV p. 355)

Hence the claim that teaching is "in some respects necessarily a therapeutic relationship".

I believe, however, that a great deal of confusion is introduced into the situation by the use of the word "therapy" in any of its forms. For when we talk about the need for therapy, we imply the treatment by some means, usually medical, of a pathological condition; the notion of "disease" seems to be inseparable from it. The implication is of some morbid state which necessitates the application of specialised techniques in order to return the patient to "normal". In other words, there are two important factors in any situation demanding the application of therapeutic methods: one, the need to posit an initially diseased state, and the other the application of specialised techniques, having in mind simply the reform of the diseased state. It is *possible* that some at least of the people who employ the term may be using it methaphorically—in the way in which modern philosophers use it when they refer to their job of linguistic analysis as fulfilling a therapeutic aim. If this is so, it should be made clear, on the whole, I suspect it is not.

Now the upholder of the therapeutic importance of the teacher's function may argue—and he will be able to draw sustenance from Freud's own frequently repeated assessment of the situation—that, in fact, we are none of us completely normal; that to some extent, we are all subject to abnormalities which may affect us in varying degrees at varying times. Freud himself puts it:

> For the borderline between normal and what are called morbid mental states is to some extent a purely conventional one; furthermore it is so fluid that probably everyone of us oversteps it many times in the course of a day. (Quoted by Ernest Jones: *Life of Sigmund Freud* Vol. 3 p. 449)

What interests me about Freud's account is the way in which it assumes the possibility of making sensible statements about something as abstract and hypothetical as another's "state of mind". For indeed, the only way in which we can come to any understanding as to what is going on in another's mind is through his *actions*, through what he does or through what he says. Only by watching him and interpreting what he does can we arrive at any conclusions —which even then need to be interpreted with care—concerning what is going on in his mind. And it is only when in some way or other he behaves in a manner which, by the standards of social convention and acceptable behaviour in our society, would seem to be distinctly odd that we have any right to suggest that there is anything abnormal about him. Freud's statement about normality and abnormality then, can only be interpreted either as a suggestion that, if we watch people, we will notice behavioural oddities much more frequently than we would if we had not been warned, or as a piece of autobiography.

Unless, then, people tell us about odd feelings or desires or unless we observe indications—they may, of course, be slight and subtle ones—of unusual or queer behaviour, it seems to me that we have no right whatsoever to assume irrationality or some form of abnormality. We only need to seek explanations of behaviour—except for some specialised purpose, like a psychological enquiry—when that behaviour strikes us as odd; and, then even, there may be perfectly simple explanations, necessitating no deeper search, for some at least of the oddities we encounter.

Now the notion of therapy, as a constant part of the teacher's job, assumes the continuing presence of the abnormal or diseased or morbid. Yet when we look further into those statements of Freud which, if I am right, have led people to make such an assumption. we find, in fact, that apart from the explicit statements or actions of others, we have no evidence whatsoever to justify any such assumption. The only possible reasonable mode of behaviour for a teacher, then, is to act as if the children in front of him demonstrated those characteristics which we have come to expect of "normal" children of the age concerned, and to adapt his procedures accordingly. He would only be called upon to alter his procedures radically if he encountered something strange in relation to expectations.

Let us assume for the moment, however, that he *has* encountered something which makes him suspect that all is not as it seems to be. What is he to do? To some extent, of course, it will depend on the degree of oddity, and the inability to satisfy himself as to possible reasonable or conventional explanations. But if this situation arises, what is to be done? An entirely different set of procedures become relevant. Here the morbid, diseased state has arisen, and the procedures necessary for treatment, cure, healing become necessary.

Now there are a variety of reasons why it is undesirable for one person to operate in the two different roles with the same child. It is in any case not very likely that one and the same person will be adequately trained in the exercise of the two techniques, teaching and therapy, though, of course, it is not in any way impossible. But the relationships between child and therapist and child and teacher are of quite a different order. Teachers and therapists are concerned about different things: the teacher seeks to work with the child's interest in the real world, interpreted as either the external phenomena of sense experience or the internal one of conscious wishes and desires provided these betray neither unusual nor pathological symptoms. The therapist concerns himself only when the external or internal worlds appear under pathological aspects, when the aim is the understanding of what lies behind the symptoms, not the conscious manipulation of the external world in the name of curiosity and creativity. Susan Isaacs, who fully understood the distinction, says:

> . . . the unconscious wishes as such are not, and cannot be within [the teacher's] competence—any more than the teaching and training of the child

in skilful manipulation or understanding of the *external* world is within the competence of the analyst. (*Social Development*)

In the pursuit of their respective roles, it can also be noted that the analyst employs a degree of impersonality in relationship with the child which is no necessary part of the teacher's role. And Susan Isaacs adds the warning: "The explosive material of the unconscious can only safely be handled by trained analysts working in a proper technically controlled analytic environment."

I cannot, then, think that the teacher is at any time called upon to fulfil a role in any way analogous to that of the therapist; and I believe that the teaching situation can only be confused by failing to preserve the necessary boundaries. I believe, too, that such confusion may lead to an over-valuation of certain attitudes on the part of the teacher, particularly one of what is called "permissiveness"; and I would suggest that, in the face of what many have pointed to as the creative force of tension in the teaching situation, the emphasis on permissiveness may perhaps spring in part from a confusion between the necessity of permissiveness in the analytic situation referred to above and its desirability in the teaching. I would suggest, too, that the desire to avoid tension in the classroom may have been influenced by Freud's model of the release from excitation followed by a state of equilibrium in accordance with the law of constancy as the desirable human norm. (There are probably other, socio-political democratic, egalitarian factors involved also—a pervasive anti-authoritarianism.) Indeed, I often suspect that the imputation of unconscious motivations springs from a concern to urge the virtues of a certain sort of teacher personality, the implication being that those who depart from this idea pattern must be in the grip of unconscious anxieties etc. which make them "authoritarian". The imputation of unconscious influences on behaviour can all too easily be used as an explanation of personality traits of which we disapprove. It might be as well to bear in mind that there are "permissive" personalities whose unwillingness to make up their minds or to take decisions would in itself seem to be neurotically motivated—it results, that is to say, in distinctly odd behaviour.

I have been suggesting, so far, then, that those, who like Freud himself on at least one occasion, would urge that "every . . . person [concerned with the bringing-up of children] should receive a psychoanalytic training, since without it children . . . must remain an inaccessible problem to him", have no grounds for their contention. A therapeutic situation would, of course, demand such a training;

a normal teaching or parental one does not. At the same time, I would not deny that a certain knowledge of some elements of psycho-analytic theory could help the teacher and the parent in certain situations.

Even here, an initial word of warning is necessary. I have referred earlier to a certain lack of moral refinement inherent in the Freudian view, and to a feeling of dissatisfaction with Freud's views on "reality". The relevance of this diagnosis to education I now want to make clear. An element of moral debility has crept into "progressive" schooling through its emphasis on relaxation, its concern to remove all tensions, its frequent indifference to notions of achievement, its hostility to externally imposed standards, its continual and excessive emphasis on the importance of personal relationships in the classroom and its comparative lack of interest in the creative tensions built up by a common, impersonally generated pursuit of objective learning. Although there have been other influences at work, one cannot help feeling that Freud's hedonism, together with his views of human fulfilment in essentially negative terms of discharge of tensions, attainment of equilibrium, fulfilment of the law of constancy, has contributed to this state of affairs. Thus successful living implies a state of nullity, an absence of stimulation, an escape from tension; and human creativity involves not a harsh, bitter, perpetually renewed, demonic, immensely joyous struggle with intractable material and media, through which man achieves that measure of control and transcendency over the internal and external worlds and thus reaches what Ortega Y Gasset calls "the height of the times" but a release, an acquiescence in harsh reality, a mere therapeutic excercise. "Reality" is, as I have noted, something to come to terms with, not something to "conquer". Who indeed, would blame the Freud of psycho-analysis for this? His world, after all, is the world of morbid states and diseased psyches, and his recipe that for a bare minimum of rational existence, it should not be accepted as a norm of human possibilities and potentialities. We have indeed fundamentally mistaken his purpose; and he himself has helped our mis-interpretation by venturing, like so many in our times, in fields where he has no necessary competence to speak. His scientific work, crude though it will inevitably seem after another hundred years, as seems all the scientific work of even the greatest earlier scientists, nevertheless places him among the supreme scientific geniuses of all time, the equivalent of Copernicus, Newton, Darwin and Einstein. His model of the functioning of the human psyche has enabled him to exercise a measure of control over morbid states which entitles him to the gratitude and plaudits of mankind. My attempt to sort out and distinguish the roles of teacher and therapist implies no disrespect whatsoever for the threapist. But such a model has no necessary connection with normal states and is, indeed, even in connection with diseased states, a mere construct, an artifact which serves a limited purpose of "explaining" a range of psychic phenomena; just as in its day the billiard ball model of the atom served to clarify, at the then stage of knowledge, the findings of the physicists. One of the curses of psycho-analysis has been its popularity; and Freud has been treated as a seer, instead of as a genius in a strictly limited sphere. On the whole, I cannot help thinking it would have been a good thing if psycho-analysis had remained as esoteric a matter as modern somatic medicine, understood as requiring a highly specialised training and left alone by the laity. The teacher, indeed, might be encouraged to know as much in the field of psycho-analysis as he is at present taught about health education, and no more.

Perhaps the most useful thing that the teacher could learn from Freud would be to leave alone or treat with care and delicacy certain aspects of children's behaviour—in many instances seeking expert diagnosis rather than accepting rough rule-of-thumb methods which have served the school-master throughout the centuries. Just as the most ordinary teacher will usually treat gently the bilious child with an upset stomach, so he ought to learn to tread gently with certain behavioural problems which formerly he would have regarded as within his province. For example, sexual behaviour among children should be treated with care and circumspection, and in case of persistence expert advice should be sought. The phenomenon of persistent and prolonged "naughtiness" should be regarded as the complex manifestation of inner disharmony it is and again, where necessary, psychotherapeutic treatment provided. Some understanding of the possible affective interferences with cognition and learning in general should be given so that sudden fallings off in effectiveness of apprehension can be investigated, or backwardness more successfully diagnosed. Freud provides further confirmatory evidence of that belief which the progressives have held from at least the time of Rousseau, that the child has urges and desires within him which must be allowed for when teaching him; particularly has he confirmed beliefs in the vital importance of the earlier years, when the ambivalence of the child's feelings needs particularly sympathetic handling. Where these young children are concerned, the traditional good infant teacher's combination of sympathy and firmness has received confirmation: it is a commonplace that Freud gives no support to the extreme libertarianism which was popular among progressives some time ago. Susan Isaacs herself makes this perfectly clear in words which have been strangely neglected: thus, in emphasising the elements of phantasy and tension which accompanied the early phases, emerging often as outbursts of hate and destructiveness —implicit in Freud's own formulations of instincts—she drew attention to the role of the "good, strict parent" in the upbringing of even the youngest children and repudiates any idea of complete freedom, supposing such were attainable:

> What the child actually needs is that the parents and the adults who make up his social world should represent to him a stable and ordered world of values, values closely related to the child's real abilities at any given age, and based upon an understanding of his psychological needs, but which are, nevertheless, firm and unwavering in themselves. Young children do need to feel that the adults around them are stronger than themselves and represent, not the forces of destruction, but those of ordered creation. (*Social Development*)

I hope that, by now, the nature of my plea will be sufficiently clear. Freud's theories have magnificently helped certain types of people suffering from a limited range of psychic disorders; their efficacy there is manifest if not totally undisputed. In other spheres, their value is much more open to question. His model of psychic equilibrium has its relevance within a restricted sphere because, at the present stage of discovery, it has its explanatory uses; even here, it may in time be superseded. Elsewhere, its application is highly disputable and may even be unfortunate. His morality may be reasonably adequate to many of the crude dilemmas of neurotic obsession; elsewhere it is coarsely inadequate. Where the work of the educator is concerned, a similar drawing of boundaries is necessary. The teacher's relationship with the child is defined in terms of the limited endeavour arising out of the transmission of skills and knowledge. It is only when the psychically "odd" or "unusual"—within the meaning of the terms implied above—is encountered that the teacher requires a rough diagnostic power to decide whether the disturbance is rationally explicable in terms of common disappointments or sorrows, or springs from a profounder malaise. If the latter is suspected, he must seek expert help; to assume any therapeutic competence would be at once arrogant and dangerous.

Thus Freud is best regarded as a genius within a strictly limited sphere; any suggestions of competence outside that sphere, though not to be ruled out *ad hoc*, need scrutinising with the greatest care. In the same way, untrained laymen must not take unto themselves a competence which they simply have not got. Any teacher can aspire to the sensitive insights inherent in great literature; but to assume a technically complex role without the training that is its essential pre-requisite would be a grave folly.

PARENT EDUCATION: AN INTERNATIONAL SURVEY

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I. Introduction

IN 1955 the Unesco Institute for Education in Hamburg sent a questionnaire concerning the basis, methods, results and problems of parent education to all member states of Unesco and to a number of individuals and organisations known to be active in this field. Replies and numerous documents were received from about forty countries. In the same year thirty representatives from various countries met in Hamburg to discuss parent education from three different angles: (*a*) in relation to pre-school education, (*b*) within the framework of school systems, and (*c*) "Schools for Parents" and other specialised agencies.

The survey which is the subject of this paper was first drafted in 1957. It was based on (i) documents and information received by the Unesco Institute, (ii) the views and group reports of the 1955 conference, and (iii) published and unpublished studies. It was revised and brought up to date in 1959 when a second international meeting held in Paris offered the opportunity of having sections of the survey checked by representatives of various countries. The paper offers a brief summary of some of the results of this investigation which is, in effect, a study of parent education in the 1950's in 35 countries (1). The States included in the inquiry vary considerably in many respects: historically, geographically, politically, socially, economically and in their ideological background. They include the old European States (e.g. France, Germany and Italy), the newly founded independent States of Asia (e.g. India, Cambodia and Nepal), Communist countries (e.g. Poland), Moslem States (Egypt and Jordan), the Jewish State of Israel, predominantly Roman Catholic and predominantly Protestant countries (e.g. Portugal and Norway).

I shall first describe general trends, then briefly outline four characteristic patterns and, in conclusion, comment on the contribution of psychological research to parent education.

II. General Trends

Parental care and mental health. The importance of responsible parenthood and competent parental care is widely acknowledged, in the first place as a protection for the mere physical survival and the health of mother and child; and there is, secondly, an increasing (and, in fact, often rather uncritical) acceptance of the thesis of a close causal connexion between parental care and mental health. Whatever the social development of the country, good parentcraft is acclaimed as an indispensable safeguard against various social ills: neuroses, delinquency, educational backwardness, intolerance, prejudice, hostility and child neglect.

Parental care—an educational problem. Another widespread assumption is that parental care presents an *educational* problem. It is recognised that education cannot do everything. The experience in many parts of the world shows that other factors, e.g. health, social and economic factors and physical circumstances are of primary importance in determining the quality of parenthood in a community. Where it is hard to meet the most elementary needs of food and shelter, where living conditions and housing are intolerable, social help for families, other than parent education, may be more urgent, but an educational element is hardly ever absent and is generally prominent. Taking the experience of all countries together, it may be said that parenthood is subjected to an array of different educational influences ranging from next to nothing to quite elaborate schemes or measures which are more or less systematic and more or less effective in their application.

Preparation for parenthood. Variations in policy seem to reflect differing conceptions of the relative importance of several determinants of parental behaviour. Many workers in the field of parent education to-day recognise that in parental behaviour several psychological, social and situational factors are involved and no longer believe that it is merely a matter of giving advice and information about child care and development. On the contrary, many are so convinced of the complexity of this process that they tend to reject didactic measures altogether. If parenthood is a matter of personality, it is argued, then attention should be paid to mental health and personality development, and it is for this reason that preference is frequently given to indirect approaches, e.g. preparation for parenthood in schools, sex education, human relations in the school community, and marriage preparation. In practice, however, efforts made have remained modest. Sex education or education for family life occur systematically only in about 3 countries (Japan, Luxembourg and Sweden), unevenly in another 6 and not at all in the remaining 22 on which information was available. Other school subjects which have perhaps some bearing on parental care, e.g. domestic science, hygiene, human affairs, *Lebenskunde*, Life Adjustment, occur more frequently. Outside school, for adolescents who have left school, opportunities are better. Certain facilities are reported from 29 countries and only 6 indicate none. But very few (app. 8) make a systematic effort. Generally a large number of different voluntary organisations make a partial contribution; but, on the whole, information is not easy to obtain and does not by a long way reach the majority of the population.

Direct help for parents. Maternity and child welfare centres are the most widely established service directly concerned with parent education in its narrow sense. They were the earliest institutions exercising an educational influence and are found to-day in nearly all countries on which reports were received. There are well developed schemes in 11, moderately good services in 6 and rudimentary services in another 14. In many countries advice and information are available also in books and pamphlets, newspapers, periodicals and radio and television broadcasts; and also films have been used successfully. Schools on the other hand make only a slight contribution. The most promising work occurs probably in the nursery schools. They are less hampered by tradition and depend more obviously on parental co-operation. A highly interesting experiment on work with parents is the co-operative nursery school, a movement which is spreading in U.S.A., Canada, and New Zealand (2, 3). At the next stage schools are the obvious centres for parent education in that all parents have some contact with them for many years. In most countries, however, the relations between home and school leave much to be desired. Of 30 countries which have anything to report at all on this aspect 16 mention only slight or occasional contacts. Some interesting developments were reported from the remaining 14, but in only 5 of these is there any widespread and consistent general policy of parent-teacher co-operation.

School for parents. Wherever parent education has been considered seriously, the activities so far described have not been found sufficient. Experience seems to show that some stable form of organisation is needed, frequently called "school for parents". It normally offers at least three kinds of activities: lectures and courses, group discussions, and individual help. Sometimes it is an independent foundation set up for the purpose, at other times it is sponsored by an existing body, e.g. the Zagreb school for parents by the youth welfare organisation, *Naša djeca*. In U.S.A. the National Congress of Parents and Teachers, the Child Study Association of America and several universities are particularly active. In Vienna the organising body is the municipal youth welfare department (4) and in Luxembourg the Ministry of Education, Family and Population. Sometimes the "school" is no more than a somewhat optimistic description of a modest series of lectures and discussions; but it is out of such humble beginnings that a school, in the more accepted sense, may develop. Permanent organisations of this kind serve a fairly definite geographical area, e.g. the *Institute of Child Welfare* at the University of Minnesota covers the State of Minnesota, the *Ecole des Parents et des Educateurs* Paris and its suburbs, the *Ecole des Parents du Québec* the province of Quebec. But several of the best known centres exercise an influence beyond their own area.

Restricted appeal. Reports from most countries suggest that the number of those attending meetings or courses is usually small in comparison with the total number of families in the community and frequently consists of an educated and conscientious elite of middle-class parents. Fathers are also less accessible than mothers and examples of paternal indifference and absenteeism were cited several times. In a few countries, however, in particular Poland and Yugoslavia, there seems to be a widespread demand among parents of all classes for information and help.

Group work. Everywhere the need for discussion and questions is emphasised. Many workers regard the interchange of ideas as the most valuable part that parent education can play. It is frequently stressed that the education must not overawe listeners with scientific information but should stimulate independence of thought, responsibility and initiative. Techniques employed in group therapy and experimental studies of small groups have undoubtedly influenced current conceptions of group work with parents. But in the experience of most workers in this field no single method can be considered as the only correct one. Talks, series of lectures, brains' trust, open forum, dramatisations, role playing, buzz sessions, films, tape recordings, broadcasts, demonstrations, and exhibitions have been used. Successful programmes have also been associated with practical activities (e.g. craftwork, sewing circles, cookery) with physical exercises, social gatherings, excursions or visits to places of interest (5, 6, 7).

Individual guidance. It has been a common experience among all those who have provided parent education in one form or another that it raises a demand for individual questions and for personal advice and help. An opportunity for such personal help is regarded as essential by many. Some are of the opinion that a speaker, after a meeting, should be ready to give advice on the spot. Others hold that such superficial treatment of personal problems is dangerous; in their view requests for individual help should be considered by an appropriate agency, e.g. a child guidance clinic. Several schools for parents, e.g. Paris and Geneva, and the Institute of Child Welfare at Minneapolis offer opportunities for personal consultation. In this work the principles underlying social casework, diagnostic and therapeutic interviewing and counselling are applicable.

Parent educators. To the question of who should be parent educators the answers vary: some suggest that only highly qualified experts should be allowed to take part whilst others believe that lay leaders must be used on a generous scale if parent education is to make an impact. Experience is available in U.S.A., Canada, France and Switzerland on the training of non-professional group leaders. Among professional workers two categories can be distinguished: (*a*) all persons in regular professional contact with children and families; these include teachers, nurses, social workers, medical practitioners, psychologists, youth leaders, clergy and police. They require in their initial and further training some teaching on the family, parental behaviour and attitudes, and problems of guidance. (*b*) Specialists in parent education recruited from these occupations. They should be given additional training at postgraduate level which should include psychology, the practical aspects of group leadership and techniques of guidance. In practice the distinctions between these two classes are not or not yet very clearly made. Differences in approach reflect frequently no more than differences in academic background and training.

III. FOUR DIFFERENT PATTERNS

A comparison between experiments in different countries has not brought to light any radical differences in fundamental ideas. But there are differences in emphasis and orientation and in the practical details of organisation. Some schools for parents are emphatically practical, some mainly medical or predominantly psychological or psychiatric. Different psychological convictions have left their imprint too. Certain schools for parents, e.g. in Belgium, work within the framework of religious allegiance. In France, on the other hand, they have been able to override customary divisions between secular and Catholic organisations and to serve both interests equally.

Four characteristic patterns can be distinguished.

(1) American experience illustrates a multiple and comprehensive approach. Parent education is a clearly recognisable activity, self-consciously organised and actively pursued; but it is not regarded as the sole responsibility of any one institution. No question of choice arises between a broadly based education for family life and specific parent education. Some workers admittedly appear to attribute greater importance to indirect and preparatory measures (education for parenthood, human relations in schools, marriage guidance), whereas others claim that there is still a residue of specific demands for training and guidance in aspects relative to child upbringing. But whatever the emphasis, parent education is widely thought of as a continuous effort in which various approaches are complementary to one another. Most of the work is voluntary, sponsored by local initiative, a "folk movement" as Carter (8) called it. A few national organisations, several universities and some individual workers are prominent. About forty cities employ specialists. American parent education has a history of over half a century. It includes some valuable critical assessments culminating in the current work by Brim which is due to be published shortly. Work reported from Australia, Canada and New Zealand, although on a very much smaller scale, follows along similar lines.

(2) Parent education in France illustrates another pattern, i.e. that of the "school for parents". It does not claim to supersede any incidental parent education; but as a centre of immediate and direct promotion of work with parents or in the interest of parental care it has achieved recognition. The Paris *Ecole des Parents* has been the prototype for similar developments in the rest of France and in some other countries, including Belgium, the Netherlands, Italy, Yugoslavia, and Germany. Compared with similar activities elsewhere, school for parents gives the impression of a more integrated effort There is a definite centre and continuity of development. All activities—talks, courses, publications, group work, individual advice, correspondence, mass media and publicity—are combined in one organisation. Each school can make itself responsible for

particular geographical area and the recipients of advice can establish personal contact. It is possible to pursue activities with greater consistency and to have an intimate knowledge of conditions of the area served by the school, and the possibility of an interchange of information and opinion is given.

(3) A third pattern is the long-established German *School for Mothers* which differs from the two previously mentioned types in two ways: (*a*) it provides mainly instruction in housecraft and home-making and deals with educational and psychological aspects only incidentally within the framework of practical domestic activities; and (*b*) it is intended for young girls and future mothers as much as for women who are mothers. Of special interest is the refusal to separate psychological, educational and medical aspects from house-craft but to treat them as part of one whole, i.e. family welfare. These institutions of which there are some twenty or so in Western Germany with a history going back to the end of the first world war also exist in the German speaking part of Switzerland and in Austria.

(4) Finally there is a fourth pattern, namely that which occurs in those countries in which parent education as a distinct and organised activity has so far *failed* to develop, in particular the United Kingdom, Norway, Sweden and Denmark. In these countries exist a number of equivalent services in a diffuse, or sporadic, form. British experience illustrates well this unfocalised, and informal approach to parent education. There is a good deal of caution and scepticism about doing anything more than that. Even as a term parent education is not in use. Despite this reluctance there have been developments out of the necessities imposed by certain situations: at the beginning of the century as a partial answer to the problem of infant ill health and mortality; and, more recently, as a measure to maintain mental health, to help some parents of handicapped and maladjusted children (9, 10, 11), to meet parental anxieties in the face of a changing educational system, or to reclaim neglectful parents (12).

In spite of the hesitations in some countries, the interest in parent education is spreading. It was, therefore, an enlightened move on the part of the Unesco Institute for Education in Hamburg to call a meeting last year, while things were still fluid, with the purpose in view to stimulate research. The response among participants at the Paris conference showed that there were many doubts and queries and that those working in this field are willing to face fundamental issues and to listen to the evidence of research. Questions to which answers were sought included: what are the needs of parents that can be met by educational measures? What kind of advice is given? What agencies are available for parents? What changes are produced? Several research projects were agreed upon to study these questions. Whether these plans will lead to practicable investigations remains to be seen.

IV. Psychological Contribution to Parent Education

Parent education is not only given by psychologists. It is, as we have seen, a matter of interest to teachers, physicians, social workers and religious leaders and also concerns feature writers in newspapers and periodicals and radio and television producers. All this makes it academically a little suspect and the scientifically minded psychologist may wonder whether he can make a useful contribution to it.

Two preliminary comments should be made. First he should consider that psychologists and psychiatrists in child guidance clinics or working for local authorities, and training college lecturers, directly or indirectly already give parent education. Secondly, he may have to overcome certain prejudices and conventional inhibitions and ask himself why parent education should be any less acceptable as a field of study than, say, reading, arithmetic or deprivation in infancy. It may be said that the soundness of parent education will largely (but not entirely) depend on the support of psychological research.

1. In content it must of course draw on many sources of which psychology is only one. But in regard to the psychological content it requires a continuous critical assessment of the findings of psychology which have bearing on parental care.

2. The uncertainty of policy concerning parent education, reflected in the differences between those who reject it in its organised form and those who regard it as an absolute necessity, can be resolved only gradually by an increased knowledge of the determinants of parental behaviour and the role of learning in it.

3. If methods and effects of parent education are to be evaluated, as some of the researches suggested in Paris plan to do, the studies require an adequate research design of the kind customary in good educational and psychological research.

4. Research in parent education is not only methodologically challenging; quite apart from its practical interest it is also promising from a theoretical point of view. It offers problems of adult learning, human development, communication and educational techniques.

Brim (13) who in a preliminary paper has many valuable things to say about methods of assessing the effects of parent education rightly recommends to the research worker that he should relate his work on parent education to the wider issues involved, e.g. studies on mass media in parent education to general studies on mass media, or investigations on work with parents' groups to studies of experimental groups. Parent education has something to offer to those psychologists who are interested in action research with practical as well as theoretical implications.

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FRIENDLINESS IN SCHOOLS

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1. INTRODUCTION

THEIR experience of personal relationships colour the attitudes of children and adults to themselves and to others. The experience of a loving mother and a school where he was frequently bullied lie behind William Cowper's lines, "Well tutored only while we share, A mother's lectures and a nurse's care." Friendly relationships are not only significant for individual development, they are desirable and necessary for successful community living. In industry, personal relationships are known to have a marked effect on production, absenteeism and accident rate. In homes, family relationships affect the all-round development of children, so much so that friendly foster homes are now frequently advocated in preference to the best institutions. Burt (1) has pointed to life in the divided family and to hostile group relationships, as causative factors in delinquency and Thomas (2) has shown the connexion between emotional deprivation and sex perversion. In education good relationships between home and school are vital, and friendliness between people within the school population affects children's progress. Personal relationships are at the heart of education: intellectual awakening, fresh insight, renewed inspiration have so often been known to come through persons whose warmth and generosity were transmitted whilst they communicated their subject matter. Moreno's work (3) in an approved school for problem adolescent girls showed how friendly contacts promoted mental health and socialised living, and as a result school work improved. A recent mental health report (4) mentions the indirect effects of staff relationships on the mental health of teachers and children, and indicates that children of varying stages of development and differing social dispositions make positive responses to adults who treat them with respect and affection. If, therefore, good relationships are essential for personal development and for community life at the national and international level, it would seem reasonable to suggest that schools might accept the development of friendly relationships as an important conscious aim, and that research workers might examine ways of promoting sound relationships and means of testing the results.

2. PROBLEMS

Groups of children in different schools appear to show differing degrees of friendliness and differing manifestations of it. To an outsider some schools give the impression of open friendly community living, others seem more withdrawn than outgoing. Inside the buildings, the words and gestures of the teachers and pupils seem to indicate a varying degree both of friendliness and informality. For instance, on arriving at one school the observer always found the doors open, the teachers were busy pinning up the morning paintings, children were popping in and out, putting a secret treasure "in their place", browsing in the book corner, doing monitorial jobs, talking happily in little groups and walking quite naturally from the cloakroom to the classroom. There was neither a school-bell, nor lines in the playground, the children came into school of their own accord, and the teacher greeted them in a friendly informal fashion. In contrast to this, at a nearby school, the visitor found the door locked, and had to knock loudly and rattle the latch several times to gain admittance. At the beginning of the sessions in this school there was a set procedure: a whistle blew, the children stood in lines in the playground, and marched into school at a signal given by the teacher. Inside, another teacher marshalled the children through the cloakroom. Some children would stop to give her flowers, or to show a toy puppet. The teacher would say, perhaps, "Very nice, but don't hold the line up." Meanwhile, someone at the back might push, a squabble ensue and one or two children become hurt and tearful.

The children in these two schools also showed differing responses to a visitor's friendly orders like "Will you come in now?" At the end of a period in the playground in the one school the visitor said to the child nearest to her, "Will you please come in now?" The child usually said, "Yes," or sometimes didn't answer but walked into the classroom. Other children saw this happening, told their friends, came to the classroom and so the playground emptied. When the same request was made in the other school a few girls nearby would run towards the school. Someone else might say, "They're going in," but still continue playing. The visitor would call, "Come along C," but she didn't always come. A boy might come up and say, "Are we going in?" Perhaps a few more children would run towards the school. Boys were seen playing by a cellar; one might run back and say to the others, "Miss B saw you." Another boy would come and say to these boys, "Come on we're going in," whilst another girl might hang on the visitor's arm and link her into school. They were anxious to have the outsider's attention and yet were unwilling to co-operate in obeying friendly orders like "Will you come in now please?" These variations in friendly behaviour in schools set the writer to consider the question of examining the differing degrees of friendliness in young children and to consider ways of recording these.

3. METHOD OF INVESTIGATION

Two small Church of England infant schools were selected in an area having a population density of a hundred persons per acre. The distance between the two schools was two or three hundred yards and the houses were similar. They were set in long gardenless rows in grey streets which were typical of the industrial age. Both of the schools were built about 1850, and whilst they had been slightly modified, many disadvantages, like the high windows filled with frosted glass, remained. Each school had about eighty pupils in three classrooms, two of which were small, with one large communicating room in the middle. The latter, as well as being a classroom, was a passageway to the cloakroom and was cleared on occasions to make a hall where the whole school could assemble. Except for that in the reception classes the furniture in both schools consisted of heavy dual desks. In School A they were so placed that there was a large space in the centre of the room, in School B they were arranged in rigid rows.

The outside playing space was larger in School B than in School A, but even so, both had good average-sized playgrounds.

Both schools were staffed by able, experienced teachers—two assistants and a head who also had charge of a class.

Each school was good of its kind: School A employed an informal method based on the spontaneous interests of the child and the leadership was democratic; School B accepted a more traditional authoritarian approach.

The experiment was carried on over a period of two years and the population was obtained by taking all the children in the 6+ class with the exception of:

(*a*) Those who had not had two years' full-time instruction in the school.

(*b*) Children with any outstanding home difficulties or other circumstances which might affect a survey on social relationships, e.g. twins, children with parents in prison, children who have black-outs, thieving problems, lameness, deafness, serious speech defects or any other major physical handicap.

(*c*) Children with outstandingly bad attendance records irrespective of the reason.

This resulted in the exclusion of three children only from each group.

The total population thus obtained was eighty in two matched groups, i.e. twenty-two boys and eighteen girls in School A and the same in School B.

On the Terman Merril Revision of the Stanford Binet Intelligence Test the mean intelligence quotient was 102, for School A it was 103, and for the School B 101. The mean age was 7 years 0 months, for School A it was 6 years 11 months, and 7 years 0 months for School B.

Pilot experiments were carried out for several weeks in order to find the best method of recording free play, as it was felt that friendly behaviour might be most readily studied in the free play situation in the playground where there was no teacher supervision and no play apparatus. At first, recording sheets were used which were divided into minute intervals, then sheets were tried where recordings were classified under predetermined headings like "Antagonism". It was finally decided to dispense with any specially prepared sheets and to write down in diary form everything that one child said and did in the time allocated. An experiment was then designed in which three separate observations were made of each child's behaviour during a ten minute play period in the playground, and these observations were written in diary form. All the testees wore a name plate, they played freely, and everything that one child said and did during the set ten minutes was recorded in full. Instances were noted of tale telling by any child to the investigator, and the number of play groups, and solitary players, both during the play period and in existence at the end of the period were also recorded. Table I is an example of a ten minute observation.

TABLE I

Sample of Free Play Observation Done for the Investigation

Name: Ronald

Runs into cloakroom and comes out with some Indian feathers—puts them on head and joins a group of boys. Pretends to shoot—collides with Alan—falls heavily on hard concrete floor. Gets up pretends to hit Alan then smiles and runs on. Gallops away, is caught by Alan who is a cowboy —Alan holds him by the wall. R. shouts, "Geoffrey, get your axe." Geoffrey comes, R. escapes. Runs about has a mock fight with Colin. Alan joins this fight—Geoffrey joins R. They have a mock fight and then run away. Alan gets R. by the wall again—tries to twist his wrists, R. pretends to faint and then comes round when Alan releases his wrists. R. walks behind Michael, gets hold of him from the back and puts him by the wall. R. runs into the lavatory and comes out. Jimmy shouts, "R. will you give me a feather?" R. says, "No". (Geoffrey has given some of the feathers out of his head-dress.) R. gives J. a feather. J. slides it into his hair and joins the Indians. By this time nearly all the boys have obtained a feather and are Indians. R. calls out, "All the Indians", they come up. R. talks to them and says, "You two are Geoffrey's men." He then has some himself. J. comes up to R. and says, "I've lost my feather." R. looks at him, just then another boy comes up and says, "He's not lost it—its in his pocket."

R. looks at Jimmy and then runs away.

R. calls out, "All my men—Indians." They join him then, then he runs away pretending to ride his horse and catches Colin and Fergus and brings them towards his den.

No. of groups
3 groups
1 boy sitting on his own

Tale Telling:
None to me
1 Incident of boy telling of another boy to a leader—re Jimmy and feather.

The three recordings of each testee's free play were made at well spaced intervals throughout two terms. Each play sample was examined and an analysis made of friendly and unfriendly behaviour and rated according to the categories shown in Tables II and III. These tables were based on those used by D. E. M. Gardner in "Testing Results in the Infant School" (7).

Table II listed fifteen friendly acts.

TABLE II

Friendly Behaviour Towards Other Children

1. Looked for and joined special friend.

2. Attached himself to a group of other children without asking.

3. Asked to join others, but did not join without asking.

4. Organised game(s). The child appeared to be popular and was accepted as a leader. Child volunteered for leadership, or made suggestions.

5. Invited (or was very willing to accept) another child into his game.

6. Acquiesced in another child's suggestion; showed willingness to take turns or to accept an uninteresting role for another child's pleasure.

7. Joined other(s) for a definite game, with or without invitation.

8. Engaged in games mutually agreed upon of a mock aggressive character, friendly fighting, etc.

9. Laughed, walked, stood, sat, climbed skipped or ran in company with another child, or any other friendly act.

10. Helped or offered to help others, lent property or shared toys. Offered praise, asked to share, or for a loan of, property. Asked in friendly way for fair play, or for help, or to be leader.

11. Accepted accidents cheerfully, and accidents caused by another child to himself or his property, or teasing or adverse criticism or any unfriendliness.

12. Showed sympathy or protected a child who was hurt, unfairly treated, at a disadvantage, or in distress—apologies for accident.

13. Listened to or talked for quite a long time to another child about the flowers or any interesting objects near at hand, or to any adult.

14. Watched, talked or listened to a child or group of children.

15. Acted as peacemaker in a quarrel, or tried to make truthfully statements about accident, etc., in effort to be helpful.

Table III listed fifteen unfriendly acts.

TABLE III

UNFRIENDLY BEHAVIOUR TOWARDS OTHER CHILDREN

1. Responded aggressively to chance pushes, blows, etc.
2. Refused another child's friendly gestures, or invitations to join a game, or said, "I'm not playing".
3. Deliberately took, tried to take, or retained another child's toy or spoilt his game, or refused to play fair and to keep accepted rules of game. Interfered, deliberately tried to annoy.
4. Gave a direct refusal to a request for help.
5. Ignored another child's distress.
6. Defended his own rights aggressively, or suggested unnecessarily that game was not fair.
7. Tried to or attained his ends by force (with or without success). Conditional play.
8. Chased, with intent, threatened, pushed, or hit another child without apparent provocation, or any other aggressive act, e.g., hair pulling.
9. Gave help unwillingly.
10. Ignored friendly gestures and remarks from others; refused to play with others.
11. Refused either to welcome other child into his game, let him have a turn in a game, or to share property.
12. Ignored other child's need of help.
13. Laughed (unkindly) at other's mishaps, or any other unfriendly reaction, or ignored other child's accident.
14. Threatened to or made adverse remarks to adult about colleagues i.e. tale-telling.
15. Made adverse remarks to playmate or to other children about his colleagues.

A third of all the recordings were marked by two independent assessors. Before they began the marking the investigator met the two assessors, discussed the lists of categories of behaviour in Tables II and III, and then the investigator and the two assessors marked the records independently and correlations were done on the scores they obtained, in an attempt to measure the reliability of the investigator's own results. The correlations thus obtained are shown in Table IV, and after this the investigator marked all the samples alone.

TABLE IV

CORRELATIONS OF THE SCORES OF THREE INDEPENDENT ASSESSORS OF THE FREE PLAY SAMPLES

FRIENDLY BEHAVIOUR

Free School Assessors	*r*	*N*	*Formal School Assessors*	*r*	*N*
E. B. H. L.	·894	19	E. B. H. L.	·434	22
E. B. S. R.	·778	19	E. B. S. R.	·782	22

UNFRIENDLY BEHAVIOUR

Free School Assessors			*Formal School Assessors*		
E. B. H. L.	·914	19	E. B. H. L.	·867	22
E. B. S. R.	·740	19	E. B. S. R.	·910	22

The experimenter devised a Home Environment assessment sheet which referred to the child's family background, his independence, physical well being, and socio-economic circumstances. The sheets were given to the class teachers and the former class teachers with a request for independent assessments, and there was discussion on the procedure to be followed. Although both of the schools were small Church of England schools where the children and their parents were well known to the teachers this assessment sheet could only be taken as a very rough guide. It did however suggest that the socio-economic conditions of the children in the two schools were very similar, though slightly in favour of School B.

In addition the Terman Merrill five-point rating scale on willingness, self-confidence, social confidence and attention was given and scored independently by:

(*a*) the psychologist doing the intelligence test,
(*b*) the class teacher,
(*c*) the previous class teacher.

The ratings of these traits were made so as to obtain additional information about the children being studied, but this was subordinate to the information obtained by the free play samples. The ratings were made by the psychologist in order to get some qualitative estimate of friendly behaviour in the interview situation with a comparative stranger. The teachers in each school assessed children in the classroom situation, thus, there were three independent assessments made.

4. Results

1. *Results of free play observations*

(*a*) The incidence of friendliness in School A was 1261 and 949 in School B.

(*b*) The incidence of unfriendliness was 103 in School A and 162 in School B.

(*c*) The friendly/unfriendly ratio was 12:2 in School A and 5:8 in School B.

(*d*) The incidence of tale-telling was 39 in School A and 122 in School B.

(*e*) The number of solitary players was 39 in School A and 48 in School B, and the number of groups in School A was 419 and 468 in School B.

As the average daily attendance in both schools during the 85 sessions was 26, then if School A had fewer groups and fewer solitary players there must have been more children playing together in the groups than in School B.

2. *Results of the Personality ratings*

None of these reached the 1% level of significance.

Details of these results can best be seen in Tables V, VI, VII, VIII.

TABLE V

FREQUENCY DISTRIBUTIONS OF PERSONALITY TRAITS IN SCHOOL A

	Psychologist's Assess				*Present Teacher's Assess*				*Former Teacher's Assess*			
Marks	W	Sf.C	Sl.C	A	W	Sf.C	Sl.C	A	W	Sf.C	Sl.C	A
2	3	2	6	2	13	4	3	5	8	5	6	6
1	18	15	16	13	19	11	11	10	12	9	13	8
0	16	17	14	18	6	16	13	14	16	16	15	16
−1	3	6	4	7	2	8	11	10	4	9	5	9
−2	0	0	0	0	0	1	2	1	0	1	1	1
Total	40	40	40	40	40	40	40	40	40	40	40	40

TABLE V (*cont.*)

FREQUENCY DISTRIBUTIONS OF PERSONALITY TRAITS IN SCHOOL B

	Psychologist's Assess				*Present Teacher's Assess*				*Former Teacher's Assess*			
Marks	W	Sf.C	Sl.C	A	W	Sf.C	Sl.C	A	W	Sf.C	Sl.C	A
2	4	0	4	4	8	4	4	2	9	6	7	1
1	14	11	8	5	10	3	4	6	12	6	6	7
0	21	19	16	25	22	26	24	21	14	17	18	19
−1	1	10	11	5	0	5	5	7	4	7	8	10
−2	0	0	1	1	0	2	3	4	1	4	1	3
Total	40	40	40	40	40	40	40	40	40	40	40	40

TABLE VI

MEAN SCORES OF PERSONALITY TRAITS IN SCHOOLS A AND B

	Psychologist's Assess				*Present Teacher's Assess*				*Former Teacher's Assess*			
Mean Score	W	Sf.C	Sl.C	A	W	Sf.C	Sl.C	A	W	Sf.C	Sl.C	A
School A	·52	·32	·6	·25	1·075	·225	·05	·2	·6	·2	·45	·225
School B	·52	·025	·075	·15	·65	·05	·025	−·125	·6	·075	·25	−·175

STANDARD DEVIATIONS OF PERSONALITY TRAITS IN SCHOOLS A AND B

	Psychologist's Assess				*Present Teacher's Assess*				*Former Teacher's Assess*			
	W	Sf.C	Sl.C	A	W	Sf.C	Sl.C	A	W	Sf.C	Sl.C	A
School A	·74	·78	·86	·8	·82	·96	1·02	1·03	·91	1·0	·97	1·04
School B	·71	·72	·98	·85	·79	·89	·96	·95	1·02	1·15	1·05	·89

The significance of the differences between the scores of Schools A and B was shown in Table VII.

TABLE VII

RESULTS OF THE TEST OF SIGNIFICANCE OF PERSONALITY RATINGS

	Willingness	*Self-Confidence*	*Social Confidence*	*Attention*
L.E.A.'s Psychologist's Ratings	No difference between the means	1·748	2·54	·542
Present Teacher's Ratings	2·37	·841	·112	1·464
Former Teacher's Ratings	No difference between the means	·518	·886	1·856

Only two differences were significant beyond the 5% level and none reached the 1% level.

Table VIII gives the total number of points scored by the forty testees in each group, and shows that, in ten out of the twelve cases School A made the higher score and in two cases the score was the same, but in no case did School B have a higher score than School A.

TABLE VIII

GROUP SCORES OF PERSONALITY TRAITS

	Total No. of points scored for Willingness	*Total No. of points scored for Self-Confidence*	*Total No. of points scored for Social Confidence*	*Total No. of points scored for Attention*
(1) L.E.A. Psychologist's Assessment of				
(*a*) School A	21	13	24	10
(*b*) School B	21	1	3	6
(2) Present Teacher's Assessment of				
(*a*) School A	43	9	2	8
(*b*) School B	26	2	1	−5
(3) Former Teacher's Assessment of				
(*a*) School A	24	8	18	9
(*b*) School B	24	3	10	−7

In the tables the following abbreviations are used as column headings: W = Willingness; Sf.C = Self-confidence; Sl.C. = Social Confidence; A = Attention.

5. Discussion of Results and Conclusions

Although the results of this investigation can only be suggestive some interesting points for discussion emerge from them. Firstly there are appreciable differences in the degrees of friendliness and unfriendliness in Schools A and B. Secondly, as Buhler indicated, observational methods can be used for examining the behaviour of children, and in this investigation the observation of children's free play, and the recording of it in diary form has produced more useful information than the personality ratings which could be subject to various misconceptions. Thirdly, if this observational method were improved then more valuable information about young children's social behaviour could be obtained and supplemented by standardised tests. Fourthly, if a suitable yardstick for the measuring of degrees of friendliness were devised and used by a skilled team it might be possible to throw more light on current problems and controversial topics as, the best method of developing friendliness in children, the relationship between a teacher's personality and the method she chooses, the effect of staff relationships and school atmospheres on learning etc.

Some answers to some of these questions are already available. Lewin (5) in his work on "Social Climates" suggested that there was a relationship between leadership and children's responses and that the same children under "authoritarian", "democratic" and "laissez faire" leadership changed as their leadership changed. Anderson (6) supported Lewin's findings and suggested that in his investigation, teachers whose words and gestures indicated a democratic approach illicited friendlier responses from their pupils than the more dominating teachers. Gardner (7) in discussing the results of one of her investigations said "It is quite evident that the children in the experimental schools were distinctly more friendly and co-operative towards each other than were the children in the control schools, and that quarrels were less frequent." Khan (8) suggested that school performance can be related to experiences and classroom climates, as well as to intellectual ability. The results of these and other similar investigations mentioned by Fleming (9) have far reaching implications since the future of civilisation depends not so much on better school buildings or scientific inventions as on better human relationships. Whilst as teachers we may not be held responsible for the attitudes which children bring to school, we cannot remain indifferent to the attitudes they take away in view of the evidence that friendliness can foster friendliness. The time would appear ripe for a more serious consideration of how friendliness and co-operativeness can best be fostered.

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UNDERSTANDING MATHEMATICS AMONG GRAMMAR SCHOOL CHILDREN (I)

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I. Understanding as an Aspect of Learning Distinct from Attainment

On studying mathematics as a field of learning one may sort out the learning end-product according to one or the other of two different criteria: the learning material or the learning process. The learning material in mathematics may be numerical, symbolic or spatial. This has led to the traditional classification of the subject into arithmetic, algebra and geometry. Taking the other criterion, we may study the mental processes involved in different learning activities in order to place learning with the same psychological features in the same category. In doing so we may sort out what we learn—or teach—into the following:

1. *Terms with Mathematical Meaning*

For a child a circle may mean (i) a round figure, (ii) a curved line, (iii) a line around a point, (iv) a locus of a point, (v) the path of a movable point around a fixed one, (vi) a line moving at a constant distance from a fixed point, (vii) a figure with a centre and a radius, (viii) a line enclosing a space, (ix) a locus of a point at constant distance from a fixed one, or (x) a figure with all its points equidistant from a fixed point. Assuming that the child is thinking with a two-dimensional model, only the last two meanings could be considered to express the correct conception of a circle; they are the only statements which reveal the specific characteristics which make a figure a circle.

If a child, asked to give an example of a binomial, gives (i) $3x+5y=7$, (ii) 74, (iii) ab, or (iv) $(a+b)$ $(c+d)$, he has a wrong concept. All these examples reveal the child's understanding that a binomial is concerned with two things, but in each case the two things are fitted together differently to make the concept.

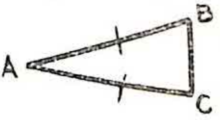
Similarly with any arithmetical concept. A prime number, for example, may mean to a child a number which involves no fractions, a number which if divided by one or by itself leaves no remainder or, of course, a number which can only be divided by one and by itself without a remainder.

The psychological feature common to all situations irrespective of the kind of material forming the concept (spatial, numerical or symbolic) or the branch of mathematics in which it is mostly used, is the abstraction of the essential characteristics which give the term its *mathematical* meaning. If a name is to be given to this type of learning it is, of course, *the understanding of concepts.*

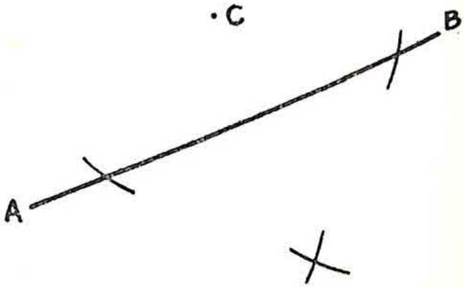
2. *Situations Calling for Fixed Response*

In this section of the subject matter the child is expected to recall the isolated facts such as the properties of geometrical figures, the tables and numerical relations between units of measurement, and the many rules in algebra. Another type of fixed response is that in which the child is expected to be able to carry out the short cuts, techniques and procedures of the arithmetical and algebraic calculations, and of the geometrical constructions.

The psychological feature dominant in this type of learning is the formation of a permanent bond between stimulus and response. For instance the stimulus "a^2-b^2" should produce the response "$(a+b)(a-b)$". Similarly "£500 at 4%" should produce the response "$500\times\frac{4}{100}$"; and the diagram should produce the response "$\angle C=\angle B$". These are examples of situations where the child is expected to give the correct response almost in a "conditioned" manner.



In some other cases the response is a standardised sequence of consecutive steps. In solving the equation $6x-(x+2)=13$, for example, the child has to (i) remove the brackets, (ii) eliminate -2 from the left side, (iii) simplify both sides and (iv) find the value of x. In adding the fractions $\frac{1}{6}$ and $\frac{3}{5}$ he has to (i) find a common denominator, (ii) change the two fractions to have the same denominator, (iii) add the two new numerators and (iv) simplify. In order to construct a perpendicular to AB from C, the child



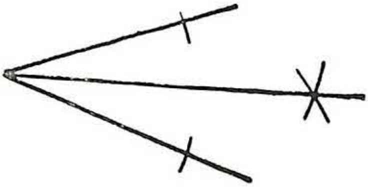
has to (i) draw a circular arc of centre C which cuts AB at two points, (ii) with these two points as centres he has to draw two arcs with the same radius to meet at a point which he (iii) joins to C to give the required perpendicular.

All learning activities which teachers label "mechanical" involve a fixed response either merely as an isolated fact or as a standardised technique or procedure. Although there is good deal of evidence that much of the learning takes place in a mechanical way, we cannot forget that the same group factor has been found to run through these "lower" operations and the higher ones (2) involved in problems. The writer prefers to label this type of learning *the acquisition of facts and skills.*

3. *Principles Underlying the Fixed Responses*

These principles are the answers to "why?" whenever the validity of a mathematical fact, short cut or technique is challenged. When a child multiplies 175 by 23 correctly there is no guarantee that he has been consciously aware of the idea behind placing the partial product of the 2 one place to the left of that of the 3. He may be doing it blindly as a set of movements (mental and physical) or he may have given the process a false meaning. For example, he may understand the underlying idea and put down the partial product as a number of tens; or he may simply write it in the correct columns, assuming there is an invisible 0 in the units column. It is important to remember that, in fact, every arithmetical process or step in a process involves a mathematical idea.

The same applies to the learning of algebra. For the child who changes the sign of the term he is transposing in an equation, the process may have its real meaning, namely, that of adding—or subtracting—the same quantity to equal quantities; or it may be a blind application of the rule "carry to the other side and change the sign". In all the computational side of algebra one may find such situations where a short cut or an habitual procedure can be performed with or without understanding of the mathematical idea behind it.



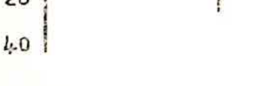
In geometry, the child who performs the steps which lead to the bisection of an angle may carry them out as a skill achieved by the formation of habits or with the intention of creating two congruent triangles, or he may have given the procedure the false meaning of creating two similar triangles with corresponding equal angles.

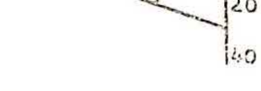
All these examples involve the same psychological feature, which is mainly the abstraction of the essential characteristics which make a mathematical fact, short cut or procedure valid. In general terms, the mental process involved may be labelled *the understanding of principles.*

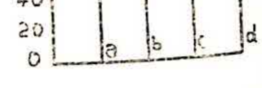
4. *Situations Calling for Non-Habitual Responses*

When a child is given the data: a purse contains 250 coins consisting of threepences and sixpences with the total value of £4 . 0 . 0, and is asked to find how many threepences and how many sixpences there are, he has his own mathematical interpretation of the situation. He may formulate the problem as $3x+6\ (250-x)=960$, or as $6x+3\ (250-x)=960$, using x to refer to the number of threepences or sixpences as he thinks appropriate. He may also formulate the situation as $x+y=250$ and $3x+6y=960$, or $x+y=250$ and $3y+6x=960$, using x and y to refer to the required numbers as he personally determines. Then he applies the techniques he already knows to find the numbers for which x, or x and y, stand.

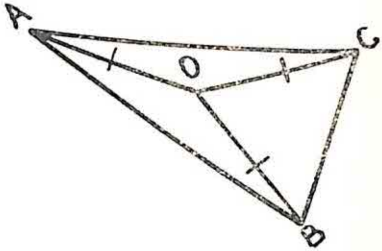
Suppose a large group of children are asked to represent graphically the data: the prices of articles a, b and c have risen 20%, 40% and 10% respectively and the price of article d has fallen 25%; one may well get at least the following variety of graphical representations:







With the data: OA=OB=OC=6 and ∠BAC=30°, if asked to find the length of BC, the child may see a circle of centre O and with A, B, and C on its circumference and then go on to ∠BOC=60°; or he may focus his attention on the two isosceles triangles OAC and OAB, which leads to another solution.



All these examples have the same psychological features of the organisation and reorganisation of data in order to reach a goal, the means of reaching it being in the learner's possession; but he has to make the decision of what means to use and how to use them. It is true that in many situations there is only one solution, but it is always the child himself who must take the necessary steps of orientation to the problem, producing the relevant material and judging it (3). This type of learning may be labelled *the solving of problems.*

Applying this classification of four types of learning to the three branches of mathematics the writer was able to use a battery of 12 tests in a factorial study (4) to investigate whether these types are distinct as different aspects of learning. The results have given some evidence that the two types labelled "understanding of concepts" and "understanding of principles" seem to belong to one educational ability, while those labelled "acquisition of facts and skills" and "solving problems" belong to another ability. This means that situations which involve abstraction of characteristics which give a term or a process a mathematical meaning require one ability; while situations which involve the formation of habits, recollection of facts and use of them require another ability. In other words, understanding and attainment are two separate educational abilities in the learning of mathematics.

2. THIS STUDY

The work reported in this article has been devoted to the "understanding" side of learning. It is a qualitative study of children's understanding of certain mathematical concepts, processes and short cuts. We have tried to answer such questions as: to what extent has a certain mathematical term or process been understood?, what are the different shades of meaning a term or process has among learners? and what patterns and lines of thought seem to account for the different meanings?

It was thought that the most appropriate stage in the child's educational career for testing was towards the end of the grammar school course. Children of the fourth and fifth years were tested during the last week of the second term in the scholastic year 1955-56. In the following table are given the numbers of children who completed the tests.

	Fourth Year			*Fifth Year*			
Test	*Boys*	*Girls*	*Total*	*Boys*	*Girls*	*Total*	*All*
Arithmetic	280	323	603	258	227	485	1088
Algebra	285	353	638	325	234	559	1197
Geometry	251	324	575	261	203	464	1039

Schools were chosen on a random basis to cover all parts of England.

3. How to Test Understanding

The method of testing the attainment side of learning is straightforward. It consists only of giving the child "an exercise" or "a verbal problem" and letting him answer. It is not so easy to test the understanding side.

Suggestions have been given in the writings of Buswell (5), Glenon (6), Orleans (7) and Hartung and Fawcett (8). Among these suggestions are: (*a*) giving a formal definition of a term, (*b*) associating a word with an example, (*c*) providing an example to illustrate a term, (*d*) indicating, by means of a diagram, an example or a statement, a knowledge of the meaning of a word presented in a context, (*e*) associating a word with a situation in which the figure, relation, operation, etc., it symbolises or presents might be used, and (*f*) recognising the misuse of a word in a context.

When we drafted the test items we took each one of the mathematical concepts and processes on its merit and constructed the question which seemed to suit it the best.

The topics which could be fairly assumed to have been taught by the end of the fourth year were: (*a*) in arithmetic: the four operations, the highest common factor and the lowest common multiple, factorisation, decimal fractions, ratio and proportion, square and cube roots, averages, areas and volumes, simple and compound interest; (*b*) in algebra: symbolism, generalisation of number, directed numbers, the four operations, simple equations, simultaneous equations, quadratic equations and the function; (*c*) in geometry: angles, parellelism, congruence, similarity and circles. It is almost impossible to present here all questions, responses, results and comments and we shall only present, as samples, a few items from the three branches of the subject. Although in our analysis we have dealt with the responses of boys and girls in the fourth and fifth year separately we only present here the percentage of responses among the whole sample. An asterisk will mark the correct response.

4. Examples of Children's Understanding

1. *The Meaning of Division*

Question: If you do not know how to multiply, how to divide or how to use the logarithmic tables, how can you get the answer of 875 ÷ 35?

Responses:

	%
*1. Repeated subtractions	15·2
*2. Repeated additions	9·7
*3. Using concrete objects to do the example	1·6
4. Working the example out in the ordinary way	4·5
5. Working the example out as a fraction	6·8
6. Repeated subtractions but failed to give the answer	4·3
7. Repeated additions but failed to give the answer	6·1
8. Unidentified answers	10·9
9. Missed out	40·9

Comments: Division appears to have two correct meanings among children: (i) how many times the divisor could be subtracted till the dividend is exhausted, and (ii) how many equal numbers (divisor) could be added till the dividend is reached. Only about one-fourth of the 1088 children gave a correct response. About 10% had an incomplete concept of the process. They seemed to have a notion that division is a substitute for repeated subtractions or additions but they could not follow the line of thought to the end. 11% worked the example out. These children appeared not to have any concept more than that of *doing the sum.*

2. *The Meaning of a Decimal Fraction*

Question: ·9 and ·57 are decimal fractions (or decimals for short). What is a decimal fraction?

Responses:

	%
*1. It is a fraction given in terms of tenths, hundredths, etc.	62·0
2. It is a number with a decimal point	11·6
3. It is another way of writing fractions	20·8
4. It is another way of writing percentages	1·6
5. None of the above	1·8
6. Missed out	2·2

Comments: The decimal fraction as a fraction, the units of which are tenths, hundredths, etc., seemed to be understood by about two-fifths of the whole sample. Two main diversions from the correct meaning appeared to occur. For 21% the decimal fraction was just another way of writing fractions with no specific meaning for the word decimal, while for 12% the spatial picture of *the fraction with a decimal point* was the main characteristic giving the term its meaning.

3. *The Principle Involved in the Multiplication Process*

Question: Study the multiplication example on the right. It is written in two different ways. Look at the way you are used to. Why is the partial product 878 moved one place to the left?

$$\begin{array}{|l c r|} \hline 439 & & 439 \\ 26 & & 26 \\ \hline 2634 & \text{or} & 878 \\ 878 & & 2634 \\ \hline 11414 & & 11414 \\ \hline \end{array}$$

Responses:

	%
1. Because it is the rule	2·0
2. Because it comes right	·7
3. Because it must begin under the multiplying figure	30·1
*4. Because the partial product is 878 tens	61·7
5. None of the above	4·9
6. Missed out	·6

Comments: This question was a multiple-choice one. The figures give clear evidence that the only significant wrong conception about the partial product was that it must begin under the multiplying figure. This may be interpreted as meaning that the children have in their minds a spatial picture instead of a meaningful procedure.

4. *The Principle Involved in Multiplying Mixed Numbers*

Question: In multiplying $4\frac{1}{3}\times 6$ we usually do it in the following way:

$$4\tfrac{1}{3}\times 6=\frac{13}{3}\times 6=26$$

What is the idea involved in changing $4\frac{1}{3}$ into $\frac{13}{6}$?

Responses:

	%
1. Multiplying 4 by 3 and adding 1	10·8
*2. Changing 4 into thirds	56·4
3. Following the rule in such cases	5·3
4. Getting rid of 4	21·3
5. None of the above	5·3
6. Missed out	·9

Comments: The principle was understood by about 56% of our sample while 32% were divided between a pragmatic attitude "to get rid of 4", and explaining what they did as "multiplying 4 by 3 and adding 1". To 5% it was just a rule they were following with no specific meaning.

5. *The Meaning of an Equation*

Question: the following are different algebraic relations:

(*a*) $y=2x+3$ (*c*) $2x-2=2\ (x-1)$ (*e*) $x^2-y^2=(x-y)\ (x+y)$
(*b*) $3x+2=5$ (*d*) $y=3x^2+3x-7$ (*f*) $x^2+3x=5$
Write down all the cases which express an equation.

Responses:	%
1. All cases	20·0
2. b, f, a, d (Conditional and indefinite equations)	5·8
3. b and f (Conditional equations)	19·1
4. b or f (One case of a conditional equation)	5·9
5. b, c, f (Relation with one unknown)	7·5
6. c, e (Confused with identity)	4·0
7. a, d (Confused with function)	3·8
8. Other answers	28·4
9. Missed out	5·5

Comments: Mathematicians do not seem to agree on what is meant by the term "equation". Godfrey and Siddons (9) wrote: "an equation is a statement of equality which is true for certain values only of the letters contained in it". Some contemporary text-book writers in America seem to have another concept. Snader (10), a Professor of Mathematics in the University of Illinois, wrote, "an equation is a statement showing that two expressions are equal", and then he goes on "to consider several types of equations": the formula, the identity and the conditional equation. By the last he means "an equality which asks a question". If there is such disagreement among teachers and text-book writers we cannot expect the term to have a consistant meaning among children. We only wanted to find out what meaning they had adopted. 20% seemed to have adopted Snader's conception and only 6% Siddon's. 19% saw only $3x+2=5$ and $x\ +3x=5$ as equations. These children seemed to have in mind the concept of the conditional equation. 7·5% considered $3x+2=5$ and $2x-2=2\ (x-1)$ as equations. They may have envisaged an equation as composed of x's and the "=" sign. 4% confused the equation with the function and another 4% with the identity.

6. *The Main Principle Involved in Solving Fractional Equations*

Question: In solving the equation $\frac{5x}{6}-\frac{3x}{4}=1$, John multiplied both sides by 48 and got $40x-36x=48$. Is this right or wrong and why?

Responses:	%
*1. Right because he is multiplying equal quantities by the same number	19·0
2. Wrong because 48 is not the lowest common multiple of 6 and 4	46·3
3. Right, because we cannot solve fractional equations without getting rid of fractions	22·2
4. Wrong, because there are no fractions on the right-hand side of this equation	·7
5. None of the above	8·6
6. Missed out	3·2

Comments: It is evident that the most frequent response was the second. This illustrates the children's mental fixation on the habitual procedure without any awareness of the mathematical idea behind it. Only one-fifth of the 1197 seemed to understand the correct meaning of the process.

7. *The Meaning of the Answer to Two Simultaneous Equations*

Question: Solving the two simultaneous equations: $x+y=5$ and $3x-4y=1$, Jane got the answer $x=3$ and $y=2$. What does this answer mean?

Responses:	%
1. Two values of x and y which make $x+y=5$ numerically equal to $3x-4y$	8·2
*2. Two values x and y which make $x+y$ numerically equal to 5 and $3x-4y$ equal to 1	53·3
3. Two values of x and y which are obtained by getting rid of the variables one after the other	21·7
4. Two values of x and y which make the numerical value of $3x-4y$ five times the numerical value of $x+y$	3·4
5. None of the above	10·7
6. Missed out	2·7

Comments: It is clear that in a little more than one fifth of the 1197 cases the correct meaning was replaced by a wrong one which was merely a description of the procedure we follow in solving the two equations by elimination.

8. *The Principle Underlying the Solution of a Quadratic Equation by Factorisation*

Question: If $(x-3)(x+2)=0$ we can conclude that the roots of this equation are $x=3$ and $x=-2$. How can you explain that this conclusion is right?

Responses:	%
1. Reversing the signs of the numbers in $(x-3)$ and $(x+2)$ gives the roots of the equation	10·4
*2. One of the brackets must be equal to zero and this occurs if $x=3$ or $x=-2$	48·4
3. Multiplying the numbers in $(x-3)$ and $(x+2)$ gives the roots of the equation	4·3
4. This equation is a quadratic one which has two roots	25·3
5. None of the above	7·5
6. Missed out	4·1

Comments: Only about half the children know the mathematical idea, while for a quarter the idea has been overshadowed by the number of roots of the given equation. 10% have adopted a routine: to reverse the signs of -3 and $+2$ to get the roots, without giving this routine any meaning.

9. *The Meaning of a Circle*

Question: What is the meaning of a circle?

Responses:	%
*1. Figure drawn by a point moving around a fixed point keeping the distance constant	20·5
*2. Figure with all points equidistant from a fixed point	30·6
3. A round figure, a curved figure, a line around a point or a uniformly curved line	14·3
4. A line with no ends	3·3
5. A line enclosing a space	1·1
6. A line with centre and radius	·4
7. The locus of a point	3·6
8. A line moving at a constant distance from a fixed point	·5

9. The path of a moving point around a fixed one	·6
10. Other answers	14·3
11. Missed out	10·8

Comments: We may be justified in assuming that a grammar school child at the last stage of his course can recognise a circle, but does he know its mathematical meaning? The figures show that 21% of the 1039 children had a correct dynamic concept of the circle while 31% had a correct static one. The same two types of concept also show in the wrong answers. The most frequent wrong static concept was that which explains the curvedness of its boundaries. Of the wrong dynamic concept, the most frequent was "it is the locus of a point" without any statement of the conditions covering this locus.

10. *The Meaning of Congruent Figures*

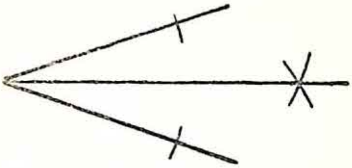
Question: What is the meaning of congruent figures?

Responses:	%
*1. Figures equal in all respects	32·5
*2. Corresponding sides and angles equal	16·3
*3. If applied to each other they exactly fit	5·2
*4. Equal in shape and size	1·7
*5. Exactly the same	1·1
6. Conditions for the congruence of triangles were given (correctly or wrongly)	23·4
7. Sides or angles equal	1·4
8. Sides equal	·8
9. Angles equal	2·6
10. Areas equal	2·2
11. Similar in every respect	1·2
12. Other answers	7·4
13. Missed out	4·2

Comments: Five correct shades of meaning were traced in the responses of the children tested. The most frequent response summed up the relation between congruent figures as "equal in all respects". The second specified the equality of sides and angles and seemed to imply the areas. The third was the disputed one involving transposition. The fourth, "equal in shape and size", appeared to be based on the visual image of the two figures: similar with equal dimensions. The most frequent wrong answer was that in which a set of conditions for congruence of triangles was given. This answer involves two psychological points, firstly the specification of triangles when the question is about congruent figures, and secondly the confusion between the concept and some condition from which the characteristics of the concept emerge. If two sides and the included angle in one triangle are equal to the corresponding sides and angle in another, then the other corresponding side and angles, and the areas, become equal, and the two triangles become congruent. Some children do not understand this distinction.

11. *The Principle Underlying the Procedure of Bisecting Angles*

Question: In bisecting the angle Richard drew the arcs shown on the figure opposite. These steps led to the right answer. What is the idea Richard had in mind when he did so?



Responses:	%
1. To produce two similar triangles	6·2
2. To produce two triangles equal in Area	7·2
*3. To produce two congruent triangles	45·5
4. To follow the procedure known in such cases	21·1
5. None of the above	16·2
6. Missed out	3·8

Comments: The most frequent wrong response is the third one which reveals a passive attitude in learning the procedure. It may be worth mentioning that in another experiment 80% successfully bisected a given angle but only 62% knew that they were in fact creating congruent triangles.

5. CONCLUSIONS

This study of wrong responses given by children was undertaken with the purpose of tracing some psychological patterns in the kinds of errors made. The errors were classified according to the psychological characteristics which seemed to underlie them, and in this way it was possible to detect the following patterns:

(*a*) Verbal fixation where the child's mind has been set on the verbalisation of a rule or formula as a substitute for the real meaning of the process or concept.

(*b*) Passive fixation where the child has developed a passive attitude towards learning the meaning of a certain process. To him it is just a rule or procedure to follow.

(*c*) Action fixation where the meaning of a certain concept has been obscured by a manipulative response. The highest common factor of 8, 12, and 20, for example, has no meaning beyond that of working out the example.

(*d*) Distracting effect of irrelevant clues in the situation, where the child does not extract the meaning from the abstract characteristics involved but from some clues which, although present in the situation, do not form a part of the data.

(*e*) Symbolic and spatial pictures, where the real meaning of the concept or process has been replaced by some symbolic configuration, e.g., an equation is just some expression with an "=" sign.

(*f*) Meaning taken from a special case, where the process of generalisation of a concept or principle has not taken place. Instead a particular case has been taken as the generalised form, a clear example of which is the association of the term "alternate angles" with parallel lines only.

(*g*) Transposition of meaning, where a certain concept has gained the definition of another and lost its own. Some children, for example, have the concept that the complement of 78° is 102°, which means that the term complement has taken the meaning of supplement.

(*h*) Meaning amalgamated with facts, where the basic definition expressing the essential characteristics of a concept is lost among facts based on the definition itself. The concept of a parallelogram as a quadrilateral composed of two pairs of parallel *and* equal sides can be taken as an example.

To investigate the possibility of a sex difference in understanding mathematics the tests were given to just over 100 boys and 100 girls in mixed schools. The t-test was then used to compare the scores for boys and girls and determine whether the differences were significant. In the following table are given the numbers, means, standard deviations and "*t*" in the three tests:

	Number		*Mean*		*S.D.*		*t*
	Boys	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*	
Algebra	102	107	20·23	17·70	4·19	5·55	3·73
Arithmetic	120	116	23·51	19·85	6·06	5·41	4·90
Geometry	112	123	24·73	18·52	6·82	6·52	7·11

The results suggest the superiority of boys in the three branches of the subject, especially in the case of geometry.

A study was made of the amount of success achieved in teaching meanings. In the following table are given the percentages of successful responses among fifth year children:

	0%–25%	26%–50%	51%–75%	76%–100%	*Total Items*
Arithmetic (Boys)	8	17	18	3	46
Algebra (Boys)	16	11	13	4	44
Geometry (Boys)	8	8	14	15	45
Arithmetic (Girls)	11	19	12	4	46
Algebra (Girls)	16	12	12	4	44
Geometry (Girls)	7	15	17	6	45

The evidence is clear that, when grammar school children leave school, many of their mathematical concepts have not yet been correctly developed. Instead, a variety of wrong concepts have been formed. It is the belief of the writer that as teachers we must know as many as possible of these wrong meanings in order to direct our teaching in the correct way. We hope that the work reported here is a start in this direction.

NOTES AND REFERENCES

1. The material for this paper was collected during the writer's work for a degree of Ph.D. in the University of Birmingham Education Department. The author owes a debt of gratitude to Professor E. A. Peel, to Mr W. O. Storer, and to the head teachers of the many schools which co-operated in this study.
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NEGATIVE NUMBERS IN SUBTRACTION

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THERE are words in our language which express ideas that are opposite and correlated, words such as *beginning* and *end, past* and *future*. Indeed, so important are these that Roget in his *Thesaurus* has placed them in two parallel columns on the same page "so that each group of expressions may be readily contrasted with those which occupy the adjacent column and constitute their antithesis".

Words which express opposite and correlated ideas have an important bearing on arithmetic also when the correlated terms can be expressed in numbers. Then the one which represents a positive idea is denoted by a positive number and the other, which represents the opposite idea, is denoted by a negative number. For example if 10, in appropriate units, represents a *credit*, then – 10, in th same units, will represent a *debit* of equal and opposite amoun again, if 10, in appropriate units, is a bank balance, then – represents an equal and opposite amount which is said to be "in t Red".

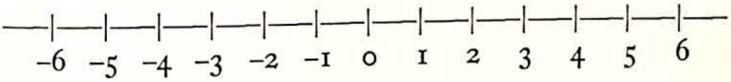
So a debit is a negative credit: a balance "in the Red", a negativ balance.

It is a matter of interest to discover that there is this common ground in arithmetic for such different ideas as

West, the opposite of East
South, the opposite of North
B.C., the opposite of A.D.
Loss, the opposite of profit
Debit, the opposite of credit
In the Red, the opposite of in the Black
Fathoms, the opposite of Height above sea level

In these examples we see another demonstration of the generality of arithmetic, but the common ground which these different ideas find in arithmetic is not the real significance which the negative numbers have for arithmetic. They are important in themselves because there are as many of them as there are positive numbers and because they relate to O as do their positive counterparts. Thus, just as a positive number is so many more than O, a negative number is so many less than O. As a consequence we can count through O either from the positive into the negative or from the negative into the positive.

This can readily be demonstrated on a number axis.



In reference to this axis, for our immediate purpose, we associate counting from left to right with the + sign, and counting from right to left with the − sign. On a floor or playground line the children "count up" on the + sign, and "count down" on the − sign.

Counting can start from any number, positive, negative or 0. Then, counting three down from 2 the result is -1, an operation that is completely expressed in arithmetic as $2-3=-1$, and counting three up from -1, the result is 2, so that $-1+3=2$. If counting down starts from a negative number, the result is a larger negative number, e g. counting five down from -1, the result is -6, so $-1-5=-6$. (A borrower already in debt increases his indebtedness by further borrowing.)

Such results as these are of much more than academic interest because the use of negative remainders in subtraction has the effect of liberating subtraction from the limitations of the positive bonds so that it becomes a straightforward process free of all artificialities and restraints. This is the consequence of practical importance which flows from the use of the negative numbers, as the following examples may serve to show. (It makes for economy of words if we use "minuend" for the starting number.)

Groups of 10

Example: $12-3$

$$\begin{array}{rcr} 12 & = & 10+2 \\ -\ 3 & = & -3 \\ & & \overline{9} \\ & & \overline{-1} \end{array}$$

In the ones $2-3=-1$. This is recorded below the $\overline{\underline{\quad}}$ lines, and then subtracted from the 10 in the minuend. Result, 9.

Example: $32-13$

$$\begin{array}{rcrr} 32 & = & 30 & +2 \\ -13 & = & -10 & -3 \\ \hline 19 & & 10 & +9 \\ \hline & & & -1 \end{array}$$

In this example the 1 is subtracted from *one of the tens* in the minuend, giving nine ones.

Being left with 20 in the minuend 10 is subtracted from it, giving one ten in the result.

Example: $202-138$

$$\begin{array}{rcrrr} 202 & = & 200 & +\ 0 & +2 \\ -138 & = & -100 & -30 & -8 \\ \hline 64 & & & 60 & +4 \\ \hline & & & -40 & -6 \end{array}$$

The process:

$$\begin{array}{rcr} 2-8 & = & -6 \\ 10-6 & = & 4 \\ 0-10 & = & -10 \\ -10-30 & = & -40 \\ 100-40 & = & 60 \\ 100-100 & = & 0 \end{array}$$

The "long" recordings give way to the shorter

$$\begin{array}{r} 12 \\ -\ 3 \\ \hline 9 \\ \hline\hline 1 \end{array} \qquad\qquad \begin{array}{r} 32 \\ -13 \\ \hline 19 \\ \hline\hline 1 \end{array} \qquad\qquad \begin{array}{r} 202 \\ -138 \\ \hline 64 \\ \hline\hline 46 \end{array}$$

Soon the recording of the negative remainder is dispensed with, for the result is the complement of it (excluding the sign).

In the above examples, 9 is the complement of 1; 4 is the complement of 6.

Example:

$$\begin{array}{r} 3032 \\ -1759 \\ \hline 1273 \\ \hline \end{array}$$

In the ones, the complement of 7 is 3
In the tens, the complement of 3 is 7
In the hundreds, the complement of 8 is 2

It now becomes clear that if the remainder is positive it is recorded direct, and if the remainder is negative, its complement is recorded (excluding the sign).

Example:

$$\begin{array}{r} 60351 \\ -49118 \\ \hline 11233 \\ \hline \end{array}$$

In the ones, complement of 7, 3
In the tens, positive remainder, 3
In the hundreds, positive remainder, 2
In the thousands, complement of 9, 1
In the ten thousands, positive remainder, 1

The technique is the same for groups other than 10.

Groups of 12

Example:

$$\begin{array}{lr} \text{s.} & \text{d.} \\ 1 & 2 \\ & -\ 3 \\ \cline{2-2} & 11 \\ \cline{2-2} \end{array}$$

In the pence the difference is −1 and, the group being 12, the complement of 1 is 11.

Groups of 20

Example:

$$\begin{array}{cc} \pounds & \text{s.} \\ 3 & 4 \\ -1 & -17 \\ \hline 1 & 7 \\ \hline \end{array}$$

In the shillings the difference is -13, and, the group being 20, the complement of 13 is 7. Having used one of the pounds, the difference in the pounds is positive, 1.

Groups of 12 and 20

$$\begin{array}{ccc} \pounds & \text{s.} & \text{d.} \\ 3 & 11 & 4 \\ -1 & -17 & -9 \\ \hline 1 & 13 & 7 \\ \hline \end{array}$$

In the pence, the complement of the difference is 7. In the shillings, the complement of the difference is 13.

Groups of 12, 20 and 10

$$\begin{array}{ccc} \pounds & \text{s.} & \text{d.} \\ 512 & 3 & 3 \\ -395 & -14 & -10 \\ \hline 116 & 8 & 5 \\ \hline \end{array}$$

In the pence, the complement of the difference is 5. In the shillings, the complement of the difference is 8. In the pounds,

units, the complement of the difference is 6
tens, the complement of the difference is 1

It is usual to postpone the introduction of negative numbers until children are in their teens. We feel strongly, however, that negative numbers should be introduced to the very young so that they will never be taught "three from two, I cannot" and the like. Such expressions are not only at variance with the teaching of mathematics (compare $2x - 3x = -x$), they are unrealistic and false.

The objector will argue that -1 is too advanced a concept for a child to understand, but -1 is no more of an abstraction than 1, and just as children can find meaning in 1, so they can find meaning in -1. And it is our experience that children have neither more nor less difficulty with negative numbers than with positive numbers: indeed the treatment of 0 in the minuend of example 202-138 above was the suggestion of a little girl to her teacher. The child was seven and a half years old, one of a class of 40. The teacher had taught that, having used one of the twenty tens, nineteen tens were left in the minuend, from which thirteeen tens had to be subtracted.

The child objected to this on the ground that she had been taught that $0 - 1 = -1$, and applying this, she argued that, having used a ten, -10 was left in the minuend. Then $-10 - 30 = -40$: and how right she was!

JAMES THE FIRST, HEADMASTER OF RUGBY

by ALICIA C. PERCIVAL
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THE comma makes a difference. Dr Thomas James was not the first Headmaster of Rugby, but the earlier of two Headmasters (unrelated) of that name. Yet, in a way, it was with him that Rugby School as we know it began; indeed, the rise of the public schools (other than Winchester, Eton, and Westminster) may be said to have started with Rugby and Shrewsbury almost half a century before the appointment of Dr Arnold.

The school which Lawrence Sheriff had founded and endowed in his native town in 1567 had got off to a bad start. There were legal struggles with his family, political troubles, insufficiency of accommodation and financial stringency for nearly two centuries. The early headmasters, with one exception, do not seem to have been of outstanding quality. But in the middle of the eighteenth century, the whole situation was changed, as the result of what had been a last minute alteration in the will of the founder—he had left the school some pieces of land north of Holborn; grazing fields at the time. These had been let on a building lease which now terminated and the School Trustees faced a prospect of an income which would not only clear them of a large building debt but also give wide scope for development in new circumstances. A new man was therefore needed.

The Trustees (equivalent, so far as the school went, of Governors) appointed in 1778 a young tutor of King's College, Cambridge. For the sixteen years of his headship, during which he, no less than his noted successor, may be said to have "changed the face of the school", they gave him unqualified support and approbation.

Thomas James, born at St. Ives (Hunts) in 1748, was the son (as a brief memoir (1) puts it) of "very respectable and sufficiently opulent parents". There is a tradition in the family that, opulence having increased, the bright boy was sent to Eton to be made a gentleman. He certainly proceeded to King's to be made a scholar, and took a high place in both Classics and Mathematics at the University.

Rugby undoubtedly benefited from his scholarship, but it was his energy and the attention to detail shown in his reforms that raised the efficiency and standards of the School. The numbers increased fivefold, to 245 boys at the peak, and no doubt he—and the Trustees—were pleased to welcome several of the "sons of the nobility and gentry" as additions to the Foundation boys. (There is no indication that the latter suffered from the change.) Yet James made the most serious efforts to keep down the charges and the incidental expenses of the boys so that, even apart from the Foundationers, parents should not find their sons' education a financial burden. The whole book of rules ("Sumptuary Laws") which he left as a legacy on his retirement and which he had evidently inculcated in practice throughout his reign, shows the most precise attention given to what might reasonably be spent on the boys' stationery, clothes, laundry, mending, hair-cutting and the Dancing master. There was a regular boarding fee, increased during his years there from fourteen guineas (or less) to sixteen, for the half year. There was also payment to be made, not for class teaching, which was on the Foundation, but for the tuition of which boys were urged to take advantage as they prepared their work. In the days when classical dictionaries were rarely owned by pupils, such tuition must have been very necessary.

This brings us to Dr James's more strictly educational reforms. Before he came, all the boys were taught in one room—"Big School". In a high desk at each end, sat a master, the Head or his assistant. One of these desks survives to this day; as a relic. Later there were four of them, one in each corner of the room. The division is similar to that described by Lamb who was at Christ's Hospital at much the same period. James brought in at once the Eton system of a series of forms each with its own master; he himself (preceding Arnold in this) took the sixth and sometimes fifth forms for their classical studies. Keen as he had always shown himself on mathematics, he did not introduce them into the "business" (i.e. regular curriculum), but he set aside at least two of the three weekly half holidays for the Arithmetic master, the French master, the Dancing master and the Writing master. This last was specially engaged for the younger or backward boys. Children used to come from the age of six and stay till eighteen and upwards, so evidently the division into forms was long overdue. One of the half-holidays was always regarded as "earned" by the excellent work of a senior boy, especially in "verses" (Greek; James's introduction) and the Head would announce or write on the board: "Play for Butler" or, more rarely, "Play for Landor". These two were among his most brilliant scholars—Landor being, of course, Walter Savage Landor, whose rebellious spirit so manifested itself at Rugby that James was finally forced to ask for his removal. Samuel Butler, grandfather of the author of *Erewhon*, was himself to become the Headmaster of Shrewsbury, where he did work not unlike that of Dr James in transforming a small local foundation into a well-reputed public school.

It is from a later correspondence (2) with Butler that we get a detailed picture of Dr James's Rugby. James seems all his life to have had the ability to make and keep friends, and to write them delightfully natural and often witty letters. When Butler gained the headship of Shrewsbury, James, who had just retired, wrote out at length, as a guide to him, the time-table of all the work for each form at Rugby, from early school at 7 a.m. on Monday, to the "declamation" taught by the Head himself on Saturday. Other details abound—the insistence that every book and article of clothing should be marked with the boy's name or initials; that they should not work in their bedrooms, because that wore out the covers, but in their studies (James had initiated these, and knocked on the door before entering); that all forms should do an English exercise once a week: "Mind the spelling," he adds. The household expenses—and he does not like to take more than thirty boys in his house—come under severe scrutiny:

"Pork is here 8d. a pound, and all other meat 6d. a pound, bought what are called good and indifferent pieces together. Bread and malt are also very heavy articles and beyond all former times. Taxes, and consequently, the prices of every ordinary article are daily increasing. . . .

"I allowed four bushels of malt to a hogshead—that is, to about seventy gallons; I advise you to brew no ale at all, only the above table beer. Buy your porter or ale for your own drinking; for if your ale be accessible it will exhaust your pocket. . . . I have sometimes thought—for Mrs James had no rule—that three-quarters of a pound of meat for each boy (including bone) was rather beyond the mark, and that half a pound was certainly below it. . . . Whatever is left . . . will clearly do for a hash next day—which boys like."

Perhaps this close attention to detail obscured from his contemporaries, as through the accident of letter preservation it does to us, the very real principles on which he governed the school for over sixteen years. During this time, it is true, there were two "rebellions" in the school, neither being, however anything like the disturbance which broke out under his successor and had to be quelled with the assistance of the local farmers and a Recruiting Sergeant. "Praepostors", on the Eton model, existed in his time—Arnold found the system on which to build his theory of prefects—though it is doubtful of what their duties consisted beyond calling and reporting names for "Absence". Rewards there were ("Merit Money" was to be gained by good work), and punishments. James was remembered later by one pupil as of small stature but having "a very strong arm". Yet his main method, or what he liked to call his method of governing, was very different: "I govern more by principles of justice and what I called among the boys (my only law), the Eternal Rule of Right and Wrong . . . than by the terrors of the Rod." One has to compare this with the utterance of the sadistic master in Lamb's *Essays of Elia*: "Od's my life, Sirrah. . . . I have a great mind to whip you . . . *and I WILL, too*"; or with the reputation of that later "great beater", Keate of Eton, to realise how far Dr James was in advance of his time.

Indeed, compared with his contemporaries, he was probably on remarkably easy terms with his boys. A memorial poem describes him as:

> Sincerely courteous, cheerful with the gay,
> A child with children, thou wouldst vie in play;
> Diffusing social joy, thy placid mind
> Could cheer the languid, make the froward kind (3).

And a charming Latin epitaph written by him for a boy of fourteen who died at the school, shows his concern, also his skill and taste.

When, overworked, ill, and distressed by the loss of one of his own large family, he decided to resign, he wrote a fifty-paged letter (4) to the Trustees, discoursing on matters both trivial and fundamental concerned with his career at the school and with the well-being of the place. But what seems to bring him even nearer to our own time is the collecting of a subscription fund for an object on which he had evidently set his heart, the promotion of the singing and the purchase of an organ. (This was for the parish church which at that time the boys always attended, the school chapel not being built till nearly twenty years later.) He writes to Samuel Butler at Cambridge:

> I wish to continue to receive the half guinea subscription of any Rugby boy that may come to the University before next summer. I never proposed anything to them before, this is not heavy. I have no Library subscription (5) and you know we have here no farewell presents; whereas the Master of Eton receives a present of three, five, ten twenty guineas . . . from every boy that leaves. I have nothing, nor wish anything more than to leave this little memorial of my mastership.

The records, scanty as they are, and references to Dr James give one a vivid picture of his personality. A liveliness of mind, good will, and a perception of the sensible way to do things stand out.

Many of his ideas seem incredibly modern when one remembers that they belong to the same century as Lord Chesterfield and Horace Walpole. Even our visual aids were anticipated by his teaching—he had the wall of the playground painted with diagrams of the solar system, so that the boys could learn the various orbits and the number of moons possessed by each planet.

His portrait, presented to Rugby not many years ago by one of his descendants, shows a cheerful, roundish face, with bright dark eyes, rather a high complexion, and a liveliness which his clerical garb and his wig (he was the last Headmaster of Rugby to wear one) cannot obscure. After his death, a monument by Chantrey, depicting him seated and reading, was placed in the parish church, reverting to the school chapel when this was built.

"Every generation," wrote Dr Inge, "takes a peculiar pleasure in removing the household gods of its fathers from the mantelpiece and putting them away into the cupboard." The chapel restorers of the late nineteenth century did not put James into a cupboard, but they did the next worst thing—they skyed him. Seen from anywhere lower than the organ loft, the perspective is wrong, the Latin inscription (by Butler, of course) is illegible, and the only feature of which we can be sure is that Dr Thomas James had very large soles to his feet. Perhaps a comparable distortion has overtaken his memory. Yet not entirely. The late Dr Rouse, who wrote the most comprehensive history of Rugby School, bracketed Thomas James, the earlier Holyoak, and the later Arnold, as its three great Headmasters. He said James had hitherto hardly had justice done to him. This might be a moment for reassessment.

NOTES AND REFERENCES

1. Birch, Rev. Wm., *The Schoolmaster, A Memorial Poem* (Rivington, London, 1829), Preface.
2. The correspondence is to be found in *The Life and Letters of Samuel Butler*, by his grandson, Samuel Butler. Subsequent quotations from this correspondence are drawn from this book.
3. *The Schoolmaster*, a Memorial Poem by the Rev. William Birch (Rivington, London, 1829).
4. Letter to Butler, December 10, 1793; original at Rugby School. Quoted in Butler, Samuel, op. cit.
5. He had persuaded the Trustees to raise their grant to the Library from two guineas to ten a year.

BOOK NOTICE

HIGHER EDUCATION

GEORGE Z. F. BEREDAY, Ph.D., and JOSEPH A. LAUWERYS, D.Sc., D.Litt., F.R.I.C., (eds.), *The Year Book of Education, 1959* (Evans Bros. Ltd. in association with the University of London Institute of Education and Teachers' College, Columbia University, 1959, 63s.).

WARS usually spotlight educational problems. It was natural that the second world war—the most technical war that the world had yet seen—should focus attention on higher education. From Bruce Truscot's books published during the war, to Sir Walter Moberly's *The Crisis in the University* (1949), and Sir Eric Ashby's *Technology and the Academics* (1958), there has been an impressive literature on the universities and related fields of higher education. We cannot claim to know the answers to the questions any better to-day than we did when Abraham Flexner published his famous book in 1930. Meanwhile events are moving fast. The university population in this country has more than doubled since the war, and the expansion of science faculties has been much greater. We are beset by problems not only of content and method, but of the balance and integration of different fields of study, and also by problems of government created by the inflated size of university institutions (when Senates and even Faculty Boards become too big for the effective conduct of business, more and more has to be done by committees behind the scenes—a development which breeds mistrust and depresses morale).

If we spread our view to include university development in other countries, it becomes increasingly difficult to answer the question: What is a university? The easy answer to that question is to say that a university institution is one which conducts the full-time education of young people of the age of 18 upwards. But to say that is to shirk the real issue. Many of us would want to insist that a university, whatever else it may do, has the job of seeing and interpreting life whole. Those who hold that view, with their feet planted in history and their hope fixed upon a new unity of culture, would claim that their view of the essential function of a university is the real foundation of academic freedom. They would also claim that their view does not by any means exclude professional training, which in certain fields has for centuries given added point and purpose to general inquiry. But they would say that no institution can claim university status if it offers *merely* vocational training. By this criterion, a Farming Institute, a Dental Technicum, or a College of Horology would not be held to be of university rank, though there are Institutes of Technology which ought not to be excluded.

The slogans "Knowledge for its own sake" and "Truth for truth's sake" are often misused. Properly understood, they imply no disparagement of vocational education, but rather affirm that truth is sacred and should never be sacrificed to other considerations. So long as university institutions stand for this ideal, there is no reason why they should not give professional training, and in general respond usefully to the needs of their time and place. In fact, loyalty to truth surely embraces a practical responsibility to society, from which an ivory tower attitude can too easily be an escape. If the German universities between the wars had not been so withdrawn from national politics, Europe might have been saved from Hitler and World War II.

The ideal of pure scholarship can be an enemy not only to social usefulness but also to general understanding. The specialist in a restricted field can become so encapsuled that he pays no attention to his wider responsibility.

It was a timely decision of the Editorial Board of the *Year Book of Education* that the twenty-first *Year Book* should be devoted to Higher Education. As usual, the treatment is selective and illustrative, not encyclopaedic. Three main problems are discussed. One concerns the "universality" of university studies, especially in relation to technology; should technological training be geared to the universities or to the government? Secondly, what kind of professional education should be given in universities? A third problem is that of numbers; in particular, what proportion of the population should be trained in universities, and should college education be available to all who wish for it and are capable of profiting from it? What, also, should be the responsibility of the universities towards those who take their higher training in non-university institutions?

The plan of the book itself roughly reflects these three themes. Part I consists of a comparative study of university traditions in different parts of the world—a necessary background for more particular problems. Countries specially treated in this connexion are the United States, parts of Latin America, Yugoslavia, and Britain (there is a chapter on the University College of North Staffordshire). Part II discusses the position of professional studies in higher education. Special reference is made to Britain, Sweden, France, the United States and Brazil. Part III concerns problems of control and financial organisation; illustrations are taken from the United States and Italy as well as from this country. Part IV is devoted to the important question of academic freedom, with reference to the United States, the Argentine, South Africa and Makerere; and there is some discussion of the case of the dismissed professor in Tasmania. Part V discusses the relation between institutions of higher learning and other institutions, with examples from Denmark, Germany, India, New Zealand and the United States.

In this edition of the *Year Book* the Editors (who contribute a long and valuable introduction) follow their usual practice of inviting a number of contributors to write chapters, but leaving these contributors free as to what they write. Whatever disadvantages this method may have, it at least guarantees that the various writers say what they really think.

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EDITORS

E. A. PEEL
H. J. HALLWORTH
A. M. WILKINSON

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THE NATURE AND DEVELOPMENT OF CONCEPTS

by R. M. BEARD

Lecturer in Education, University of Birmingham

PART I

Concept formation in children's thinking with special reference to the work of Piaget

1. INTRODUCTION

THE importance of concepts in thinking has been recognised by many writers. Huxley (1) believed that the capacity to form concepts as a result of the expansion of the association areas in the cerebral cortex might be classed as one of the biological novelties having most effect on the progress of mankind; he considered that verbal concepts opened the door to all further organisation and achievements of men's thought. The place of concepts as the essential link between fundamental psychological processes of the senses and all higher processes of thought has made investigation of their nature and development difficult; to understand both their origin in infancy and the formation and reorganisation of concepts in later life requires study not only of their relation to the perceptual and sensori-motor schemas which give rise to them but also of the means whereby the brain records and organises conceptual knowledge. Since concepts, and, in particular, verbal concepts are achieved during social interaction, their study must include understanding of the part played by emotion and environment in their formation. Further, consideration of what concepts or patterns of concepts are characteristic of various stages of development, if such stages exist, raises the questions of the part played by maturation and by intelligence in different individuals. In the 1921 symposium on the nature of intelligence the close relation of intelligence with ability to form concepts was recognised by Thorndike, who believed that quality of intellect depended on quantity of "connexions", where by "connexions" he meant possible association of ideas, or images, or concepts. Terman, in discussing the nature of intelligence, stated that the essential difference between the intellectual genius and the moron was in the capacity to form concepts, to grasp their significance and to relate them in various ways.

Studies of concept formation have, for the most part, been limited in scope. The sole considerable exception is the extensive work of Piaget and his collaborators. But though Piaget has considered the origin of concepts and their development in particular fields and has been aware of their social bases, he has not assessed the effect of differences in environment, emotional adjustment or intelligence nor, until recently, has he attempted to relate their development to the rapidly increasing knowledge of cybernetics.

2. THE NATURE OF CONCEPTS

The nature of concepts is still a matter for investigation. Some writers have identified concepts with names and words, believing that the ability to name an object is sufficient to show the existence of the concept. Max Muller took this view, expressing it in the extreme form ". . . Not only to a considerable extent but always and altogether we think by means of names, and things are no more to us than what we mean by their names." Lorimer and Munn suggested that the existence of a concept might be inferred from the equivalence of responses to diverse objects or situations of the same kind.

That these definitions were inadequate was pointed out by Piaget who, in an often repeated illustration, mentioned one of his own children who said "The slug" of every slug encountered during a number of walks but, apparently, without considering whether it was always the same slug or another of the class "Slug"; only in the latter case would it have been reasonable to assume mastery of the concept, but there was no evidence that the child was aware of the distinction. A clear instance of naming without achievement of a concept was seen in mentally defective twins aged four years who knew and named only two tables in their home; in a strange room they could not follow the instruction to put an object on the table.

Both Piaget and Valentine believed that a concept was not finally achieved until there was evidence that the child thought of an object in its absence. Piaget (2) succeeded by the use of careful observations and experiments with his own children in tracing the evolution of primary concepts of the object, space, time and causality during infancy. He found that infants only gradually learned to seek objects which had disappeared until, at about one year, it was evident that they realised the permanence of objects. After a further six months they could take account of changes of position brought about outside their field of perception; it was some months later before there was evidence of an image of absent objects and their displacements.

Since Valentine (3) found it difficult to judge, in general, whether there was evidence of thought of an object in its absence he accepted for practical purposes, Hobhouse's criterion of the use of two words together as the evidence for the existence of a concept; this showed mental appreciation of relationships in that a cognitive element common to many experiences could be combined with other elements.

Confirmation of the view that a concept need not necessarily be verbal has come from a variety of experimental work. Smoke (4) found that his subjects learned to recognise a "Dax" without being able to verbalise what they had learned. Kuenne (5) who tested learning in young children in which reward was associated with the choice of the smaller of two objects, found that successful children could not explain how they succeeded. With older subjects Heidbreder (6) found, both in experimental and clinical studies that subjects might fail to define a concept adequately though they were entirely capable of using it. Hull (7) observed that the ability to define was often a very inadequate index of the functional value of the concept. Inability to verbalise a concept was found by Hunter and Bartlett (8) to be complete before the age of five years. Older children solving their double alternation problem might say: "It's in there two times (right), and in there two times (left)." or merely: "Two times." but the under fives either failed to reply or said "I know 'cos I do." or "I don't know how I know."

Such experiments suggest the importance of vision and kinaesthetic learning in formation of concepts. Hoffman (9) comments that visual experiences are mentally ordered in a manner which is analogous to the mental organisation of concepts and that the process of concept formation derives its very form from the manner in which perception takes place. Humphrey (10) illustrates non-verbal concepts from the understanding and sketching of a machine; concepts are not verbalised but the subject "feels" what the machine will do and realises what motion will ensue as a result of a primary motion.

A sequence of events in concept formation is described from the introspections of adult subjects tested by Fisher (11). Her subjects ceased at an early stage to see the figures presented as a whole. After the first two or three exposures the common or repeated features became the most prominent elements in their perception while specific features appeared less prominent. The initial standing out of the feature was accompanied by tensions about the eyes and throat, and by recall of images of past figures which exhibited the same or similar prominent features. Subjects began to describe these verbally, by analogy with well known forms in one case, at first describing in some detail but with increasing conciseness, selecting only the important general features.

In recognising the existence of other conceptual schemas than verbal ones the importance of verbal concepts should not be underestimated. The child's ultimate representation of the world is in the form, chiefly, of verbal concepts and these can be examined and corrected through social interaction in a way that kinaesthetic and visual concepts cannot be; it is through verbal concepts that the child builds an accurate picture of his environment.

Summing up, we see that concepts are not direct sensory data but result from a mental representation of successive data of the same kind and establishment of relationships between representations. Their acquisition depends on having repeated experiences of the same sort and on the ability to form mental representations which can be recalled and compared with the data from new experiences.

It remains to consider to what extent the process of concept formation is active or passive. Most writers have favoured the composite photograph theory as described by Woodworth (12), "The features common to a class of objects summate their impressions on the observer, who, thus, gradually acquires a picture in which the common features stand out strongly while variable characteristics are washed out." We have seen such a sequence of events described by Fisher's subjects. This view gains some support from recent advances in physiology and cybernetics. Adrian (13) found that an external pattern of excitation produced a corresponding pattern of excitation in the cortex itself. Dr Colin Cherry speaking in the Third Programme in December 1956 mentioned a model of photo-cells functioning similarly to cells of the brain which could acquire a concept of a "hawk" if it was presented in various positions on frequent occasions. Grey Walter (14), in discussion, mentioned his "tortoise", a model including photo-cells, which could achieve the "objective" of reaching a bright light, by trial and error. Thus this simple machine, working in a manner comparable with the human brain, could "select" alternative ways of behaving in response to stimuli. He says: "It can be shown that a machine or animal that can extract invariants in the form of Gestalten, or patterns, is automatically capable of learning. A machine or animal that has been designed, or has evolved, so that it can learn can automatically at the same time extract Gestalten. This is a first principle of cybernetic design which has been developed only quite recently as a theorem."

The theory that concepts are the result of, or are achieved in part through, active search has also been maintained. In this case it is supposed that the individual forms a hypothesis which he tests by seeking fresh specimens of the class. Thus this theory emphasises generalisation rather than abstraction. In mentioning researches we have observed that some adult subjects looked for features similar to those they had already observed in an attempt to confirm their hypothesis. That the process is already active in young children is evident from their spontaneous queries and comments or their surprise and subsequent checking on meeting a case contrary to previous observation.

Piaget has not directly taken a part in this controversy but it will be seen that his theory of learning does not exclude either method of forming concepts.

3. THE FIRST PHASE OF PIAGET'S INVESTIGATIONS

During a first phase of investigations Piaget used largely verbal methods in studying children's thinking. During the 1920's five volumes were published concerned with the child's language and reasoning, scientific concepts and moral judgments.

Among the results included in these volumes conversations and monologues of young children are recorded; older children were asked to complete sentences which involved giving reasons, to explain absurdities such as those used in the Binet-Simin tests, to provide definitions, or to find statements with meanings equivalent to those of proverbs quoted. Their understanding of relationships was also investigated, e.g. that of being a brother and of having brothers; their comprehension of right and left was tested from their own point of view, from that of the investigator who faced the child, and with regard to objects. In testing concepts of physical causality Piaget asked children to draw a bicycle displaying how it worked and performed numerous experiments for the children to explain. Children were also asked to explain the origins of names and natural phenomena, and their concepts of life, thought and dreams were investigated. To inquire into moral concepts the children were told stories and were asked to judge actions and the fairness, or otherwise, of punishments mentioned.

Piaget's most controversial conclusion arising from his study of the children's very detailed replies was that the thinking of almost all children under seven was egocentric. *Egocentricity* was conceived by Piaget as an inability on the part of the child to be conscious of his separate identity; this resulted in inability to distinguish objective from subjective and gave rise to unconscious distortion of reality to fit the individual's conceptions. For example, children imagined human agencies and motives in discussing the origins of natural phenomena. When asked to make explanations to each other children under seven were unable to enter into the listener's point of view sufficiently to provide him with adequate information, while the listener was unable to adapt himself sufficiently to the speaker to understand even what little information was given. While his thinking remained egocentric the child avoided comparisons for he could not take in all data at a single grasp and, since every relationship requires consciousness of at least two objects, or dimensions, at once, the child could not comprehend relationships and remained insensible to contradictions.

Piaget claimed to have distinguished a number of erroneous types of explanation resulting from the child's egocentrism. Among these he defined *transduction*: reasoning from particular to particular without generalisation or logical rigour; *syncretism*: linking of things or ideas to make a global or unanalysed whole without establishing any relationship between its parts; *juxtaposition*: successive, inconsistent explanations given of the same phenomena. He grouped children's explanations of physical causality into no less than seventeen categories in which *animism*: attributing characteristics of men to natural objects, and *artificialism*: attributing natural objects to the actions of men, show the egocentric tendency to confuse objective with subjective.

For the age group tested (4 to 14 years) Piaget attempted to define stages of conceptual development and to assign approximate ages to them for various concepts. In general, stages I and II occurred before seven years, stage III between seven and eleven years, while after eleven, in stage IV, children became capable of handling more complex relationships and, in the case of moral concepts, could appreciate general laws of behaviour.

A number of British and American psychologists were extremely critical of these conclusions. Susan Isaacs (15) believed that the artificial conditions of the investigations did not arouse the full interest of the children; from observation she asserted that children thought most logically in understanding the results of their own experiments. She thought the ability to appreciate mechanical causality appeared much earlier than the middle years of childhood and attributed understanding more to interest and experience than to maturation. Hazlitt (16) criticised the form of Piaget's questions and set tasks for children to perform which required little use of language. She concluded that children much younger than seven were capable of making generalisations, but that the form of the question influenced their replies. Dixon (17) found that children as young as three years could be sensitive to contradictory relations. Valentine (3) observed that his children asked questions concerning physical causality as early as two years and that they provided some of their own rational answers by four years. Abel (18) attacking along a different line experimented with "story telling" using students as the subjects. When required to remember and pass on information from difficult passages relating to weather and astronomy students provided some instances of juxtaposition and syncretism. He inferred that these faulty forms of reasoning arose more from the difficulty of the passages and effort to remember verbatim than from inability to reason correctly.

Several critics quoted the conclusion of Burt; following his earlier study of inductive reasoning: that there was no evidence of any specific process of thought that could not be performed by a child of seven.

4. THE SECOND PHASE OF PIAGET'S INVESTIGATIONS

During the second phase of his investigations Piaget published about a dozen volumes. Of these, two described the genesis of concepts in infancy, one related to the development in early childhood of the ability to think in symbols, others traced the development of particular concepts throughout childhood and adolescence: viz. number, time, quantity, speed and movement, space and spontaneous geometrical conceptions; in the remaining books of this period he elaborated his theory of stages in development of conceptual thinking, showing the logical structures underlying each stage.

Piaget's theory of learning

Piaget's view of learning is that it results from complementary processes on the part of an organism in becoming adapted to its environment. These processes he terms *assimilation* and *accommodation*. By assimilation he means the use by an organism of something in its environment in an already learned activity. This happens when a situation evokes a pattern of behaviour by its resemblance to a past situation or when an object, or event, is seen in terms of the familiar; it is also in evidence when anything is invested with value or emotional significance. The term accommodation is used to describe the addition of new activities or modifications of old activities in response to environmental pressures or events. Thus assimilation covers generalisation and discrimination and determines which response a stimulus will elicit, while accommodation includes differentiation of responses and learning of new responses. The interplay of these complementary processes results in successive *adaptations* to the environment.

From this conception of the process of learning it is evident that both the activity of the organism and the nature of its environment are of supreme importance, but Piaget has not attempted to assess the effects of differing environments nor the influence of emotion in learning. Nevertheless, he recognises that emotion determines what will be of interest and that it provides drive in persuance of activities necessary to adaptation. In revising and elaborating his conception of stages Piaget makes no allowances for individual differences except to remark that experience may cause advancement of some individuals and to comment on the early or late achievement of certain stages in some items by bright or backward children.

Piaget's stages of intellectual development

During the second phase of investigations Piaget performed experiments with infants to discover what concepts they had achieved; with older children he provided tasks to perform or experiments to explain. As a result of these investigations he outlined three main periods of development each with a number of sub-stages.

5. PERIOD I: THE PERIOD OF SENSORI-MOTOR INTELLIGENCE

This period is marked by the development in infancy from a universe formed of pictures which can be recognised but have no substantial permanence or spatial organisation and in which the child is unaware of the part he plays to a substantial world in which spatial, causal and temporal relationships are recognised and the self is realised to be, at least practically, a separate entity. The structure characteristic of this stage which is developed gradually and achieves completion at the end of the stage is the sensori-motor group structure. This consists in systems of reversible actions where by "reversible" it is intended to imply that the child can retrace his actions by successive movements though he is not capable of mental representation of his own displacements or those of an object until the end of the stage. Piaget (19) divided this period of development into six sub-stages.

(i) 0-1 month: reflex exercises.

(ii) 1-4½ months: primary circular reactions (formation of motor habits such as thumb sucking and formation of perceptual clusters, e.g. visual space, auditory "space", tactile space, etc.).

(iii) 4½-9 months: secondary circular reactions (formation of intentional acts and prehension); the child begins to grasp what he sees, so co-ordinating his visual and tactile perceptions and to co-ordinate the other separate perceptual spaces of stage (ii).

(iv) 9-11/12 months: co-ordination of secondary schema with, in some cases, use of known means to achieve a new objective. At this stage the child begins to search for objects that have disappeared but without regard for the direction of displacement; he is unable to co-ordinate successive displacements.

(v) 11/12-18 months: differentiation of schema of action by "tertiary" circular reactions (variation of conditions by exploration and directed manipulation, e.g. pulling a cover to draw an object nearer).

(vi) 18-24 months: the beginning of interiorisation of schema indicated by cessation of action and swift comprehension of movements and causality in simple experiments. There is evidence of thought of an object in its absence.

As a result of increased co-ordination of sensori-motor schemas and hence of acceleration of movements and interiorisation of actions the child is already capable at stage (vi) of representation and of deferred imitation. At this point the development of language makes it possible for him to recall schemas which formerly appeared only in practical situations. But, before he can make use of language in conceptual thinking the child must cover once more the ground previously covered at the sensori-motor level at an extra-perceptual and social level. "His aim at the sensori-motor level was success in action, his mental activities were essentially individual and his adaptation to his environment was physical merely; in the stage of conceptual thinking his aim will be truth and his thinking will become socialised in a collective form obeying common laws."

There is no sudden transition to conceptual thinking. Piaget sees the period of conceptual thinking as divided into two main sub-stages extending respectively until seven years and from seven to eleven/twelve years. The earlier stage, preparing for concrete operation, he again sub-divided into a stage of pre-conceptual thinking until about four years and a stage of intuitive thinking subsequently.

6. PERIOD II: *A* THE PERIOD OF PREPARATION FOR CONCRETE OPERATIONS; *B* THE PERIOD OF CONCRETE OPERATIONS

A 1: *The stage of pre-conceptual thinking*

This stage begins when symbolic functions first appear. These take a variety of forms: language and drawing, imaginative games (in contrast with the exclusively physical games of the earlier period), delayed imitation and, possibly, the first mental images conceived as interiorised imitation. The beginning of representation is seen in the effective use of schema of object, space, time and physical causality, but the child finds difficulty in applying them to space much beyond his reach or to time beyond the immediate past or near future.

Since it is not possible to interrogate young children concerning their methods of thinking Piaget has least information for this stage; from observation he believes that they are incapable of true conceptual thinking, using a word indifferently to apply to classes or individuals. He has called this the pre-concept. While thought remains at this pre-conceptual stage lack of clear definitions and failure to grasp relationships result in the characteristic of egocentricity already described in considering Piaget's earlier work.

2: *The stage of intuitive thinking*

During this stage the child's perceptions dominate his thinking. It is a characteristic of perception that it is centred, i.e. only one feature or small area can be touched or viewed at a time. It can be shown that the centre of the field of vision is overestimated in comparison with surrounding features and that larger areas, since they catch the eye more frequently, tend to be overrated in importance as a result, perceptions of an object are variable even in the same person from moment to moment and take a different form if the surroundings of the object are changed. Thus, although it is possible with practice to co-ordinate a number of perceptions of the same object by a form of perceptual activity it is not possible to achieve the stability and reversibility of conceptual thinking. At this stage Piaget found children unable to understand conservation of mass when the form of a clay ball was altered for, being incapable of mentally reversing the action to restore its original appearance, they judged by some aspect of the final appearance of the object. Nor did they realise that number was conserved. When a number of beads was poured from a large box into a smaller one children stated that the number of beads had become greater or smaller according as they concentrated their attention on the greater spread of the beads or the relatively smaller area they occupied.

Similar misconceptions occurred in the field of time and speed. When children saw two toys made to undertake journeys of unequal length though starting and stopping at the same moments, they asserted that the toy which travelled farthest took longest. Their conception of age was peculiar in that they believed all adults to be of equal age since they had ceased to grow; they supposed that as children grew they would catch up in age with older children. In like fashion they judged the age of trees, seen in pictures, by the height, width or number of fruits; no child under seven years thought to ask when the trees were planted.

Towards the end of the stage, from about five-and-a-half years, Piaget noted increasing ability in making simple classifications or relations of order, and in performing elementary operations with numbers. He believed that this coincided with a decrease in egocentricity. At the same time, in explaining physical causality or natural phenomena children gave fewer magical or animistic answers, while able children became aware of some contradictions.

B: *The period of concrete operations*

Piaget believes that this period extends from about seven years to about twelve years. Its attainment is recognised by the child's ability to perform operations which he conceives as internalised responses growing from the child's actions just as, about four years earlier, images grew out of imitation. The three kinds of operations in which the child of this stage shows progressive mastery are those of classes, relations and numbers. He now becomes capable of classifying objects or groups of objects by common properties, and of grouping classes into more general classes; he can order a sequence of numbers, lengths or quantities or make a family tree and he has increasing ability to use numbers which, in ordinal and cardinal conceptions, combine ordering with classification into like groups. During this stage Piaget observed significant progress in the direction of internal consistency; he remarked that children sought a single explanation based on preliminary relating of factors in attempting to account for the results of experiments.

The structure underlying such systems of operations Piaget termed the "groupement", usually translated "grouping". Their stability depends on their having five properties:

(i) Closure or composition: any two classes can be combined to form a third, e.g. all men plus all women equals all adults; or, in measuring height A is 2 in. taller than B, B is 1 in. taller than C, hence A is 3 in. taller than C.

(ii) Reversibility or inversion: for any operation there is an opposite operation which cancels it, e.g. $2+4=6$, $2=6-4$.

(iii) Associativity: three classes combined in any order from the same class, e.g. (men + women) + children = men + (women + children).

(iv) Identity: there is a null operation formed when any operation is combined with its opposite, e.g. 2 miles north of A + 2 miles south = 0 miles north of A.

(v) *a*—Tautology: classes and relations if repeated are unchanged, e.g. men + men = men.

b—Iteration: a number combined with itself produces a new number.

During this period, as more difficult relationships are understood, the conception of conservation is more completely achieved. At six years Piaget found that most children realised mass was conserved but they did not comprehend the conservation of weight until sometime during the period 8-12 years. In the cases of volume and density conservation was not understood until some two years later.

At the beginning of the period children still had difficulty with conceptions of part and whole or inclusion of one interval within another. When they observed liquid falling from a spherical vessel stopped at five successive levels they were unable to say whether it took longer to fall from the first to the fourth level or from the first to the fifth level. It seemed that children were unable to hold in mind simultaneously events which they had seen to happen in succession.

At 7-8 children could make simple sequences but it was not until 8-9 years that they could co-ordinate two sequences. It was only then that they could co-ordinate age with date of birth. Similarly in number, children could not use ordinal conceptions, until about 9 years, to match items in two disarranged sequences of dolls and sticks.

Thus this period also may be sub-divided into two sub-stages: one of simple operations, the other the achievement of certain complete systems in the fields of space and time particularly. In the field of time it is at 8-9 that children can first co-ordinate order of succession with duration so conceiving a unique time embracing all movements and events. In the spatial field it is in the latter stage, from about 9-10 years, that children first link objects to co-ordinate systems, e.g. horizontal and vertical, or other axes of reference. By this means they co-ordinate relationships such as right-left with before-behind and so can conceive the view of a person differently oriented. It is at this time also that perspective is first correctly represented in the child's spontaneous drawings.

7. Period III: The Period of Formal Operations

A third major period of development is distinguished by Piaget and Inhelder in adolescence. Whereas concrete operations have as their object the class, relation or number, formal operations are performed with these primary operations themselves, expressed in propositions. The child was concerned with sensori-motor activities or operations with concrete materials but the adolescent conceives imaginary worlds and forms theories. He makes hypotheses and considers their implications without the need to try them in reality.

When asked to explain experiments the adolescent shows capacity to reason with respect to two or more systems at once and is capable of considering all possibilities. An achievement of late adolescence in which all possible combinations are considered in order to arrive at a solution Piaget terms "combinatorial analysis". Whereas a child in the stage of Concrete Operations can classify objects by their properties, e.g. heavy and large (h, l), heavy and small $(h, \bar{l})$, light but large $(\bar{h}, l)$, light and small $(\bar{h}, \bar{l})$, the adolescent can conceive all possible combinations of these classes; that all four may be present simultaneously, or any three of the four, any of six pairs, only one, or none at all. Inhelder (20) found in an experiment with older boys that when asked to discover the properties of five colourless liquids it was only boys of fourteen years or more who combined them systematically in all possible ways.

Another achievement which Piaget believed to emerge only in the third period was the ability to understand proportionality, or his *INRC* group. Whereas a class (e.g. animate objects) has the sort of opposite called an inverse (inanimate objects) and a relation, (e.g. *a* is taller than *b*) has the kind of opposite known as a reciprocal (*b* is taller than *a*) an operation, *I* (e.g. increasing the weight in the right hand pan of a balance) can be cancelled either by the inverse operation, *N* (reducing the weight in the same pan to its original value) or by the reciprocal operation, *R* (increasing the weight in the left hand pan by the same amount). These operations with *C*, the inverse of *R*, form the group of four transformations which is involved in solving problems of proportionality. In her experiments with older boys Inhelder (20) found that it was not until the third period that they could see how to make the shadows of rings of different sizes coincide on a screen; only then could they co-ordinate movements towards and away from the screen of both the rings and the source of light.

Throughout the reasoning of this period implication plays an important part; "if the ring is moved towards the light the shadow gets bigger", "if the rod is thin it is flexible". The adolescent discovers all three ways of expressing implication e.g. finding the alternative ways of expressing the last proposition as "either it is not thin, or it is flexible" or "to say that it is thin is equivalent to saying that it is both thin and flexible". This equivalence is the fundamental principle of consistency and Piaget believes that when it is discovered the adolescent's reasoning is subject to the mathematical laws of the group and the lattice.

8. THE CONCEPTION OF STAGES IN MENTAL DEVELOPMENT

Piaget (19) and Inhelder (14) have defined three characteristics of stages in intellectual development. The first criterion of a stage is that it should be defined by a structural whole. If a child deals with some tasks at the level of concrete operations it is thought possible to generalise to ability to deal with others of a similar type at the same level.

The second criterion of a stage is that passage from an inferior to a superior stage is equivalent to an integration; the structure achieved at a given age becomes through a gradual process of change part of the succeeding structure. For example, the notion of permanence of objects built up at the sensori-motor level becomes an integral element in the subsequent conception of conservation.

The third criterion is that the order of stages is invariable, that is, they appear in the same order in every subject. The age at which a stage is realised cannot be adequately fixed, however, since as Piaget recognises, it is always relative to the environment which may advance or impede its appearance.

The idea that mental development proceeds by stages has received support from numerous authors but has been criticised or denied by others. Support for this idea comes from those who find well-defined stages in the development of language and drawing and, to a lesser degree, from those who believe like Gessell that it is possible to describe characteristics of thinking and behaviour at various age levels. Bayley (21) and other investigators who have made longitudinal studies of children over a period of years find no sudden changes in rate of development or, if these exist, they occur at widely different times for different children. Some authors have suggested that environment may be the dominating influence in determining characteristics of childish thought such as animism and anthropomorphism; others see all mental development as largely determined by environmental influences. In so far as concept development depends on intelligence it must be subject to individual variations such as those described by the factorists.

9. THE RELATION OF INTELLIGENCE TO CONCEPT FORMATION

Attempts have been made in a number of studies to relate success in formation of concepts with intelligence as measured by some well-validated test such as the Terman-Merrill tests. Russell (22), in testing children's conceptions of life, found the coefficient of mean square contingency between mental age and stage of the answer to be ·49. In Deutsche's study (23) of concepts of physical causality the correlation between IQ and total score in concepts of physical causality was very low but few IQs were accurately known. Carpenter (24), in her pilot study, applying some of Piaget's tests with girls from 5-9 years found stage to be more closely correlated with mental age ($r = ·86$) than with chronological age ($r = ·68$).

Few factorial studies have been made specifically with concept tests, but to the extent that concept formation involves the same abilities as standard intelligence tests we should expect the same factors to appear, viz. a general factor and, after its removal, two main groups of factors, the verbal-numerical-educational on the one hand and the practical-mechanical-spatial on the other. Spearman has identified tests highly saturated with the general factor, *g*, as those which involve seeing relationships; this, as we have seen, is a capacity essential to concept formation. The importance of language in the formation and use of concept tests has also been stressed and it is to be expected that in any factorial study based on concept tests a large verbal factor should appear.

The existence of such factors, whether their origin is from innate abilities or environmental causes, is to increase differences between individuals and to give rise to considerable variability in the level of achievement of any one individual in different tasks. If, as seems probable, such factors could be extracted from children's results in concept tests it would necessarily modify the conception of overall stages of development.

10. THE EFFECTS OF ENVIRONMENT ON CONCEPT FORMATION

The influence of the environment on children's thinking both in the level of thinking achieved and in attainment of particular concepts has been frequently mentioned by Piaget. His theory of learning which is based on adaptation of the organism to its environment makes the nature of the environment essentially important. In his study of games and in tracing the development of moral concepts in childhood Piaget has linked social experience with intellectual development, but in his other investigations he has no considered the effects of different environments.

In other studies of children's thinking the environmental influences which have been most investigated are those of the home in particular through socio-economic status, and the social organisation and language in the child's country or racial group. The influence of different types of school has received little attention. It is impossible to survey the extensive literature of the subject but a few illustrations may serve to show environmental influences on children's thinking.

An example is given by Lorenz (14) of parents discouraging ability to make abstractions in a child just learning to talk. The child was saying bow-wow to all animals and his distressed pare unable to see his level of abstraction (bow-wow = mammal) suppos that he saw no difference between a horse and a cow and attempted to restrain him. In the case of Lorenz's five-year-old daughter the generalisation "rail" for all birds seen in the zoo like moorhens and coots was appreciated and encouraged.

In studies of socio-economic status and intelligence a number of investigators found an increasing correlation between children's scores and parents' socio-economic status and ratings of intelligence from infancy to adolescence. This held good even when the children were brought up in foster homes (25).

The effect of different kinds of schooling on ability in tests of achievement has been discussed by many authors but had rarely been investigated experimentally. Inhelder (18) notes that it has been found that certain spatial representations are made easier by sensori-motor explorations. These are more likely to be provided in schools where the work is based on activity. She also observed that certain comparative studies have shown that in an environment of free inter-change and discussion magical representations decline rapidly in favour of rational explanations, whereas they persist much longer in an authoritative environment.

The kind of culture in which an individual participates controls his thinking and the concepts he can form. This is evident in primitive societies where limitations in language development, e.g. no numbers above two, or inadequate vocabulary for measures, necessarily restricts number concepts and results in inaccurate conceptions of quantities. Less obvious as influences on methods of thinking are the use of metaphor, similes and analogies and the form of the language itself, e.g. the use of masculine and feminine in naming objects or the form of a verb which implies that an object performs some action on itself. Consideration of such influences suggest that the origin of child aninism is in language and traditional tales and is not inherent in the child mind. The lack of animism combined with sound appreciation of physical causality achieved by young Manu children supports this view. Mead (14) attributed this to the fact that they were forced at a very early age to make correct physical adjustments to the environment so that their entire attention was focused on cause and effect relationships, and to their exclusion from adult religious practices and traditional beliefs. She also observed the importance of the form of the language in furthering or discouraging abstraction; she gives the example of a society in hich different words are used for "snow in the air", "snow on the ground", "snow that's crisp", etc., and remarks that the child who says "snow" for all these will be corrected and will grow up poor in abstraction.

The domination of certain forms of response to the environment is seen to determine excellence or weakness in methods of thinking in certain fields. Carothers (14) mentions adult Africans who lack spatial conceptions achieved early in Western culture: when attempting to use cube imitation tests he concluded from their responses that most of the Africans did not realise that when a cube was turned round its sides maintained a constant relationship to each other. He believed that hearing played a more important part in their lives than vision, for reading and writing and playing with toys and blocks of wood are less usual in the life of the African child than in that of the European. Carothers suggests that the visual world is more continuous and always suggests the dependence of an event on a preceding one whereas in the world of sound things are discontinuous and happen more haphazardly so that cause and effect are less obvious.

The considerable variation in capacity to think in different fields according to cultural backgrounds must affect general conclusions concerning Piaget's stages. Piaget is aware of this criticism and has suggested the need for tests independent of language with material of equal difficulty to all racial groups.

11. CONCLUSIONS

In this brief and necessarily incomplete survey of investigations into children's concepts it is evident that Piaget's considerable contributions gave coherence in a field which, until then, had been the subject of fairly unrelated groups of inquiries. He has provided the useful conception of mental structures on which the successive achievement of increasingly complex concepts depends, and has traced these from their origin in fundamental psychological processes to higher achievements in logical thinking. Not all observers of children's thinking will agree that so clear a pattern of development as he describes can be traced. Those who follow him in the main lines of his theory may feel that he has not gone far enough; he has not attempted to relate the ability to form concepts with the conditions under which the child's thinking is performed. A number of investigators in this country are now engaged in verifying some of his claims or have attempted to assess the influences of individual differences due to intelligence, cultural or socio-economic background, emotional adjustment and other factors. One such study made by the writer with young children tested in a wide variety of concepts will be reported in the next issue of the *Review*.

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FIFTEEN TO EIGHTEEN IN SOVIET RUSSIA

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THE provision of educational opportunities for the 15 to 18 age groups are among the most interesting sections of the December 1958 Soviet decree "On the strengthening of the ties of school with life".

Since 1949 and until the promulgation of this decree, general compulsory education in the USSR lasted seven years from the age of 7 to 14. At 14, children who were not entering employment had the following choices: (*a*) to continue their general education for another three years thus completing the secondary or ten-year school with a grammar school type of curriculum, (*b*) to enter a secondary specialised school (sometimes known as *technicum*) where the course of training lasted usually three years also, or (*c*) to go to a vocational school of the Ministry of Labour Reserves where the period of training varied from 6 months to 2½ years, according to the manual skills taught.

The exact proportion of teen-agers entering employment or proceeding to one of the above major types of institutions is difficult to specify because the postwar size of age groups is known only approximately and the full data of the 1959 census are not yet available in detail. However, considerable expansion of educational facilities for teen-agers over 14 has undoubtedly been taking place since 1950, and it can be assumed that latterly roughly 40 per cent of each age group attended ten-year schools, while some 10 per cent went to secondary specialised and 18-20 per cent to vocational schools. In fact, about two-thirds of all teen-agers over 14 were getting some kind of full time education.

The decrease in child population due to low birth and high death rates during and immediately after the war was so great that the size of age groups born after 1941 fell to about 60 per cent of the pre-war average. The provision of longer schooling was to a certain extent facilitated by the reduction in numbers. Whereas less than 15 per cent of all children aged 14-18 studied in the senior grades of secondary school before the war, certainly more than a third were in these grades by 1958/59 when 1,600,000 boys and girls obtained their "certificate of maturity"(1). This expansion of general secondary education upset the balance that had existed for many years between the output of secondary schools and the intake of establishments of higher education. Thus, the successful expansion of secondary education may itself have been a contributory factor in bringing about the present reforms. For it should be borne in mind that ever since the return of traditional forms of schooling in the early 1930's, the curriculum of the ten-year school, leading to the certificate of maturity, was definitely rather academic: it comprised Russian language and literature (2), pure science, history, geography and a modern language, the standards of attainment reached being somewhat above the *O* level of the G.C.E.

No vocational training was provided by secondary schools, and their graduants from the point of view of employment necessarily ranked as unskilled labour. To enter production as unskilled workmen must have been a bitter disappointment for Soviet secondary school pupils who had been expecting to proceed to higher education and hence to professional jobs which, in the USSR, enjoy both considerable economic advantages and a high prestige status. In the words of N. K. Goncharov, deputy President of the Academy of Educational Sciences of the Russian Soviet Federative Socialist Republic (RSFSR), these boys and girls of 17 were both practically and psychologically unprepared to enter manual occupations.

It seems, therefore, logical to devise a form of education which both prepares teen-agers for university entrance and also teaches them a trade. This twofold aim is entirely in agreement with the views of Karl Marx and Lenin who envisaged education as a combination of intellectual knowledge and manual skill. Thus ideological arguments reinforce the demands of a national economy in danger of being starved through prolonged years of schooling of its already depleted juvenile labour force. Two other factors, which have figured less prominently in the Soviet press, may have contributed to hasten the reform. Namely, an endeavour to cater for the academically less gifted children for whom a grammar school curriculum is uncongenial, and the desire to keep within bounds the high costs of education. This absorbs already over 10 per cent of the State budget and makes considerable demands on those of local authorities, individual plants and collective farms. Further large sums will be required for expanding boarding facilities, providing nursery schools for practically all under 7 and free meals for the entire school population as envisaged by the seven-year plan.

According to the new law, compulsory education will last eight years, from the age of 7 to 15, instead of seven as previously. Up to five hours practical work per week will be the rule, but on the whole, the curriculum of the new eight-year school will be very similar to that of its seven-year predecessor. The big changes will affect the older children, those aged 15 to 18.

The *secondary polytechnical school with productive labour* replaces the old ten-year school. Teen-agers who have completed the eight junior grades continue their education for another three years; thus their schooling is to last eleven years. Two-thirds of all school hours are to be devoted to usual subjects, such as Russian language and literature, mathematics, physics, chemistry, biology, technical drawing, a modern language, singing and physical education, while one-third of the time-table will be taken up by vocational training and work in factories and on farms under the supervision of special instructors. Some schools introduce these hours of work at the rate of six per week (or one day) in the 9th grade, rising to 12 in the 10th and up to 18 (or three days) in the last, i.e. the 11th grade; others prefer their pupils to attend school four days a week and the factory on the other two days throughout the three years. Incidentally, the Soviet senior school week is fixed at 34 hours, and the length of a working day in industry is 4 hours for 15-year-olds and 6 hours for those aged 16 and 17; both have a six day week.

Although the amount of theoretical knowledge to be mastered by pupils will be roughly the same in all schools, the approach may differ according to the vocational bias of the pupils' future occupation. Prospective fitters, electricians, engine drivers, etc., will learn more physics, mathematics and technical drawing; those likely to be employed in retail trade, or as librarians, clerks and typists may give more time to humanities. This is the nearest to an "arts-science streaming" accepted in the USSR despite a good deal of discussion on the desirability of some specialisation.

The theoretical aspects of vocational training will comprise exposition of techniques and also some notions of planning and organisation of labour, principles underlying the fixing of piece rates and wages, methods of increasing the productivity of labour, improving the quality of products and reducing their costs. Some 200-300 school periods will be given to these theoretical aspects of production and 800-1000 hours to actual work at the bench. About the middle of the second year (i.e. in grade 10) pupils will be capable of producing articles which are up to standard and therefore qualify for payment. For certain types of work they will go to factories in groups, for others, e.g. when training as drivers of electrical engines, excavators, cranes, mining machinery, etc., they will join, in turn, the crew or team of adults working the machine.

Considerable flexibility and administrative competence is required on the part of both school and factory managements to organise such part-time apprenticeship, without handicapping the factory's production plans. These now include industrial training of juveniles, and the new labour law envisages definite quotas of teen-agers which factories must take on for the purpose of training. The larger plants are setting aside special workshops where teen-agers from different schools will come on different days of the week to be taught and supervised by instructors chosen from among their technicians or foremen who have attended short courses in teaching methods and allied subjects. Difficulties arise in the smaller plants and, in particular, in smaller townships with few industries where pupils will have little choice and there is a danger of their being employed on repetitive routine jobs and treated as cheap and often unwelcome and unwanted labour. To obviate this danger schools propose to expand and re-equip their own workshops for producing marketable consumer goods such as furniture or clothing. One school has set up a printing press to service the local community, another undertakes the repair of clocks, a third that of household electrical appliances, etc. In each case the repair and servicing of workshop machinery, whether a lathe or a sewing machine, is part of the pupils' industrial training. In some places two or three schools have clubbed together to set up jointly better equipped workshops. Equipment may be obtained from enterprises manufacturing school appliances under the Ministry of Education but usually the factory which acts as "patron" to the school is a better source of supply. Materials can often be obtained from the same source and the ready article marketed through the State commercial network or a producers' co-operative. As a rule, workshops pay their own way and often make a small profit. This is commonly spent on amenities, such as musical instruments for the school orchestra or the expenses of an outing, or else the money is reinvested in better tools to augment the earning capacity of the school enterprise. Occasionally, bonuses are paid out individually to pupils, sometimes as part of the graduation ceremony. There is of course some danger of school workshops yielding to the temptation of making simple but profitable articles such as packing cases for which there is a great demand; naturally the educational value of making such articles is less than that of manufacturing elaborate furniture which requires both manual dexterity and the ability to measure and calculate, to design and read blue-prints, to understand the chemistry of paints and varnishes, to master the craft of making and fixing springs, locks, handles, etc., and, eventually, to estimate costs and prices.

Much experimentation is still necessary and mistakes and disappointments are bound to occur, but Soviet educationists have already some experience in these types of practical activity. They began experimenting in 1952 with the return of polytechnisation (3) when courses in "fundamentals of production" were introduced and in the 10th grade pupils studied the working of an internal combustion engine and learnt to drive a car or tractor. Since 1956, 585 (i.e. nearly a quarter) of the schools of the RSFSR have been trying out an experimental syllabus devised by the Academy of Educational Sciences of the RSFSR. Instead of the usual two weekly hours of manual work and the six days set aside for excursions to factories, railway junctions or farms, these schools introduced four hours' practical work per week and their pupils spent 24 days (at the rate of four hours daily) doing industrial or agricultural work during the first part of their three months' summer vacation. The practical work performed was very varied. It included installing electrical wiring and fittings in the school building, repairing furniture, making new desks and shelving, manufacturing simple tools and toys for the juniors, redecorating classrooms, rebinding books, growing vegetables on the school plot and working on collective farms in groups known as "pupils' brigades". In 1956, help in the fields by "pupils' brigades" became obligatory in all rural schools. The movement for work on the farms was particularly extensive in the southern provinces of Stavropol and Krasnodar where in the summer of 1956 some 40,000 boys and girls of all ages formed 762 brigades and put in together nearly two million labour days. Some schools in Moldavia went even further, obtained land and implements from collective farms and formed "pupils' collective farms"; the entire work was carried out by school children, who also took part in the administration and the distribution of labour day payments to their members, delivered the usual quotas of agricultural produce to State procurement agencies and, generally speaking, ran the farms as self-supporting business enterprises. However, these ambitious ventures do not seem to have been imitated elsewhere on a comparable scale, though there are sometimes quite extensive school plots on which market gardening is carried out according to the most up-to-date techniques or which have been turned into chicken farms run on business lines. More often schools undertake specific tasks for the state or collective farm with which they are connected through "patronage". Payment for the work done is usually made by the farm to the school which allocates some of the money to the pupils individually and uses the rest for amenities, or the purchase of implements, seed and stock for the school plot. Recently some farms have been undertaking to supply the school as a whole (all eleven grades) with bread and milk or else with meat and vegetables as well, thus pioneering the provision of hot meals for all children, irrespective of their actual labour contribution since that of the juniors is obviously negligible. This sharing of earnings is a training in communist outlook and a first step towards the goal "from every one according to his ability and to every one according to his needs".

On the whole, agricultural work is more easy to organise, particularly since peasant boys and girls have participated in it from time immemorial. The novelty lies in the scientific approach to this work and its team organisation under the supervision of specially trained teachers.

On completing his secondary polytechnical school the pupil will have accumulated an amount of general knowledge comparable to that required by a really good *O* level candidate in the G.C.E. and a certificate of proficiency in at least a semi-skilled trade. If his ambition is to pursue his studies further, he can apply for immediate enrolment to evening or correspondence classes or become a full time day student at a university or higher specialised institute after spending only one year in production instead of two as now required from prospective applicants to establishments of higher education. This remission of a year's manual work is granted on the grounds that one third of his (or her) school time has been spent at the bench or on the land.

Schools for young workers and those for *rural youth* are the alternative route to the certificate of maturity for boys and girls entering employment. Although general education is their main concern their course now includes some vocational training. In urban schools attendance is at the rate of four hours four times a week, though some schools are attempting to provide up to 20-22 hours' instruction a week. School holidays last 12 weeks per annum. Schools for rural youth have a more seasonal time-table; tuition is more intensive in the winter months, up to 36 hours attendance per week, but their school year is limited to 26-30 weeks per annum. The length of the course is three years and should enable successful examinees to proceed to establishments of higher education if they so desire. As mentioned already, the working week of juveniles aged 15 is limited to 24 hours and that of 16 and 17 year olds to 35 hours; all workers under 18 are entitled to one month's holiday with pay. Furthermore, those who study are given one day release per week or equivalent time off. They are also granted 20 days for preparing and sitting their school leaving examinations.

Schools for young workers and those for rural youth were first set up during the war for boys and girls who had started working and missed part or all their schooling owing to war conditions. In particular, the schools for rural youth forestalled the spread of downright illiteracy. Urban schools have always been more numerous and better attended than rural ones and, latterly, they have been catering for those who had had either only a primary (four-year) education in their younger days or those who were entering employment at 14 after completing a seven-year school and wanted to proceed to "matriculation" standards. During their 15 years of existence these schools, in particular the urban ones, have enabled 1,200,000 young workers and peasants to complete the syllabus of a seven-year school and 670,000 to obtain a certificate of maturity. On the whole, they have been regarded as the backstairs of education though they did allow some of their students to climb the educational ladder right to the top including, eventually, a university degree. The number of these schools is now to be increased and their housing, staffing and standards of teaching improved drastically. The vocational bias, recently introduced, is expected both to benefit the national economy and to attract workers in their thirties who might have been put off otherwise by the length of the course. Indeed, it takes a man six years to attain a certificate of maturity if in his childhood he attended a primary school only, and another five years to graduate from the university. Now even the less ambitious may be induced to raise their educational standards if at the same time they are raising their technical proficiency. In fact, it is hoped that the majority of teen-agers leaving the eight-year school will enter employment and attend these part-time evening (or shift) schools. Eventually the difference between them and the full-time day secondary polytechnical schools

SCHOOL TIME-TABLES (RSFSR)

	URBAN SECONDARY number of weekly hours Grade			RURAL SECONDARY number of weekly hours Grade			EVENING SECONDARY number of weekly hours Grade		
	9th	10th	11th	9th	10th	11th	9th	10th	11th
Russian Lit.	3	3	3	4	3	4	2	2	2
Mathematics	4	4	4	5	4-5	5	3	3	3
History	2	3	4	3	4	4	1	2-1	2
USSR Constitn.	—	—	2	—	—	2	—	—	1
Econ. geography	—	2	2	—	3-2	2-3	—	2-1	1-2
Physics	4	4	2	5	5	3-2	3	3	2
Astronomy	—	1	—	—	1	—	—	0-1	—
Chemistry	2	3	2	2-3	3	3	1-2	2	2-1
Biology	3	—	—	4	—	—	2-1	—	—
Tech. drawing	2	2	3	3	3	3	1-2	—	—
Modern language	2	2	3	3	3	3	2-1	1-2	2
Physical culture	2	2	2	2	2	3	—	—	—
Total	24	24	24	31	28	29	15	15	15
	general technical subjects, theoretical + practical instruction + work in production			principles of agricultural production + practical work			optional training for improving professional skill		
	12	12	12	5	8	7	2	2	2
Total	36	36	36	36	36	36			
				Productive work per season (hrs.)					
				324	324	108			
							advisory + consultative tutorials		
Optional subjects	2	2	2				3	3	3
				Grand total			20	20	20

with productive labour will tend to narrow. An appropriate ratio of theoretical instruction and practical work will be found and become one of the corner stones of Communist education.

Of considerable importance in this amalgamation will be the role of the Young Communist League. Hitherto pioneers and members of the Young Communist League (*Komsomol*) of any one school formed a single organisation; now young people working in factories may prefer to join the Komsomol of the factory. Thus pupils from secondary schools may become members of the same factory Komsomol organisation as their former class mates from the eight-year school who are now employed as regular workers in the factory or farm.

Secondary specialised schools number 3,346 and train for a great variety of occupations which require semi-professional personnel, such as engineering technicians, draughtsmen, railway, mining and laboratory assistants, clerks, book-keepers, dentists, nursing and junior medical staffs, veterinary surgeons, junior and nursery school teachers, librarians, arts and crafts teachers, etc. The numbers of teen-agers entering the full-time day departments of these schools have varied latterly between a maximum of 438,000 in 1953 and a minimum of 358,000 in 1957, the decrease being probably related to the general decrease in the child population as well as to recruitment of more juveniles into employment, as suggested by the larger numbers enrolled in the evening and correspondence departments of these schools. Formerly, entrants came from the seven-year school and later, when secondary school leavers became more numerous, they were admitted for shortened courses (two years instead of the usual three and even four) or else to full length courses leading to particurally skilled occupations.

Many secondary specialised schools were set up initially by industrial ministries which for a long time shared responsibility for them with the Ministry of Education. They now come under the reorganised Republican Ministries of Higher and Secondary Specialised Education. Like technical colleges in this country they often stand midway between a technical school and a College of Advanced Technology. Great stress has always been put in these institutions on the practical aspects of instruction, now it will become even more marked. Schools training specialists for agriculture (soil scientists, veterinary surgeons, specialists in plant and animal breeding, dairy farming, agricultural machinery, the mechanisation of agricultural processes, etc.) will be trained in institutions closely associated with state and collective farms and will participate in actual farm work. The evening and correspondence departments of these schools will be systematically expanded. Apart from working as technicians, many students from the engineering technicums have found employment as instructors in practical work both in connexion with the polytechnisation of schools in general and also in vocational schools. After graduation and a spell in industry they attend six-month courses in didactics, psychology and sometimes also in marxism-leninism to qualify as teachers. The staff of specialised schools include fully qualified engineers with some training in educational methods and allied subjects. Since the aim of the Soviet government is to staff all schools with teachers who have a university degree or a diploma from an institution of higher education, the training of instructors to supervise practical work is much to the fore. Several higher institutes of agriculture including the Moscow Academy of Agriculture have set up agro-pedagogical faculties and, similarly, industrial-pedagogical faculties have been organised by the larger institutes of engineering and advanced technology. The reverse is also being attempted, namely institutes of education are forming special faculties of "physics and engineering", or "biology and agricultural science". Students completing secondary specialised schools were entitled to proceed only to institutes and university faculties within their field of study; this naturally limited their choice, so that juveniles had in fact to make their choice at the age of 14 (now 15). Like those completing courses in establishments of higher education graduants of specialised schools are expected to work according to their qualifications for three years wherever directed to by the State. This is regarded as a repayment for their being educated at the expense of the State. All education has been free since 1956 and many students of secondary specialised schools and the vast majority of university students have always been in receipt of grants.

Vocational schools will apparently remain on the whole the concern of the Ministry of Labour Reserves. Although quite a number of factory and other vocational schools existed since the early days of the Revolution, the great drive for training young workers for common semi-skilled professions began in 1940. At first these Labour Reserve schools seem to have been very unpopular and recruitment was by compulsory draft. They took boys at the age of 14 who had completed a four-year school only (and later girls also at the age of 15). Training varied from six months for lumberjacks to two years for junior railway personnel. The schools were boarding establishments, uniform was free and so was tuition at a time when fees had been reintroduced in establishments of higher education and in secondary schools for pupils attending the three senior grades (1940-56). However, many jobs towards which the teen-agers were directed upon completing their course of training were of a blind alley type, the period of direction was four years instead of the customary three to which graduants of universities, higher and secondary specialised schools are liable and, furthermore, the instruction provided by the Labour Reserve schools did not constitute any step "up" the educational ladder.

In time, particularly after the introduction of compulsory seven-year general schooling in 1949-50, these schools improved, their curriculum, although it remained entirely vocational (with 80-85 per cent of instruction time spent at the bench) became more interesting, varied and extensive, the teaching staff more cultured and better qualified, recruited often from among graduants of secondary specialised schools rather than from among older workmen, and enrolment became voluntary. It fell from the figure of 800,000-1,000,000 annual recruits decreed in 1940 to an average of 700,000 entrants a year. In 1954, when the output of secondary schools began exceeding the intake of higher education establishments, some vocational schools organised two-year courses for particularly skilled jobs connected with instrument-making and the manufacture of electronic devices. These are still to subsist for a few years, though most entrants to vocational schools will come naturally from the general eight-year school. The old inducement of free board and clothing is now being replaced by apprentice wages. At the same time it is hoped that the workshops of vocational schools can be made not merely to pay their own expenses but to contribute substantially to the school budget as a whole.

Whatever the differences in the curriculum of the four major types of schools open to juveniles aged 15 to 18 (i.e. the secondary polytechnical, the evening school for young workers, the secondary specialised and the vocational), they all combine to a greater or lesser degree general and vocational education. Many remarks of the Crowther Report apply to Soviet youth. In the USSR too, "there is a strong vocational flavour to what boys and girls value most in secondary education . . . they have reached the stage when they desire to see the relevance of what they are doing in school to what they will be doing when they leave school" . . . "there is a demand for independence which money can buy. Boys, and to a lesser extent girls, are prepared to work for it."

Evidently some aspects of Soviet education are bound to be different. State enterprises can be made to undertake the training and employment of part-time apprentices, however unprofitable their labour, as a service to the community more willingly than an employer in a private business; the special Soviet relationship to "patronage" results in individual plants or farms equipping, supplying and even building schools often attended by the children of their workers; the tradition of self-help is stronger in rural communities which have always relied on local craftsmen for their household appliances; the shortage of consumer goods makes a customer content with articles made by inexperienced and clumsy hands. Again, children are more aware of their obligations to the society which pays for their upbringing; they are educated not to try and get something for nothing; the idea of repaying society at large for nurturing them is more acceptable when the means of production belong to the nation, and this idea is more easily instilled through mass communication media when they are monopolised by a single omnipotent and self-righteously paternalistic Party. This moral and intellectual pressure may be intolerable for the lonely genius, and the spirit of collectivism fostered relentlessly by the Pioneer and Komsomol organisations may crush the thoughtful introvert. But lonely geniuses are few. The others are keen and proud to take part in the creation of a new civilisation and the spectacular growth of its material wealth.

For all its high-powered conditioning, Soviet education seems to be producing a very familiar type of *Homo faber* interested in the material world around him, in scientific discovery, technical inventions and modern industrial achievements conducive to a high standard of living, cultural amenities, abundance of consumer goods, rising wages, shorter working hours—everything that modern man acclaims as a better life in the only world the existence of which he does not doubt.

NOTES AND REFERENCES

1. The census taken in January 1959 showed that there were 17,133,000 aged 10-15 and 14,675,000 aged 16-19 within the present boundaries of the USSR. In other words, the surviving age groups born in 1944-49 averaged 2,856,000 and those born in 1940-43 about 3,669,000 individuals. The total of 1,600,000 boys and girls who obtained a certificate of maturity in 1958 included school-leavers as well as students from night school. The increase in pupils in the three upper grades of ten-year schools as well as their decrease with the arrival of the

post-war age groups is shown by the following figures (from the statistical yearbook *Narodnoe khozyaistvo SSSR v 1958 godu*, M., 1959, p. 814).

1950/51	1953/54	1955/56	1956/57	1957/58	1958/59
pupils in grades 8 to 10 (in millions)					
1·5	4·5	5·2	5·04	4·35	3·4
probable dates of birth					
1933/37	1936/40	1941/42	1942/43	1943/44	1944/45

For figures of numbers in vocational and secondary specialised schools, *ibid.*, pp. 694 and 835.

2. This article deals mainly with education in the RSFSR. In other Union republics the language and literature studied are those of the given republic; Russian is the first and compulsory foreign language taught there.
3. Polytechnical education was defined by Lenin as one "which familiarises the child with the main branches of production and closely links instruction with socially productive work". Persistent attempts at implementing it were made in the 1920's and early 1930's but ended in widespread incompetence and semi-literacy. Failure is attributable to shortage of schools, teachers, workshop equipment, tools, materials, and the difficulty of combining a knowledge of the complex working of modern industrial production with very primitive handicrafts practised in miserably equipped workshops.

THE AIMS AND SCOPE OF EDUCATIONAL SOCIOLOGY

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IN recent years there has been a growing tendency to give more and more attention to the sociological aspects of educational theory and practice in courses for the training of teachers. Yet it is rare to find a separate course, or clearly defined section of a course, in educational sociology. In this respect it is interesting to compare its position with educational psychology, which is well established as a separate subject of study. The reasons for this are partly historical and due to the earlier development of modern psychology as an academic discipline, and partly because of the obvious connexion of psychology with the techniques and skills of learning, with individual abilities and aptitudes, and with the study of child development. Upon all these matters there is a cumulative body of scientific research, and a widely accepted experimental method to guide future investigators. The sociological approach, in its scientific form, is a later growth, but one which is beginning to make as important contributions as the psychological. The subject of social psychology in many ways forms a link between the two. It is the purpose of this article to outline the present field of study open to educational sociology, to describe some of the boundaries between it and other disciplines, and to claim that it deserves a more definite and distinct place in the initial training of teachers.

Sociology has been slower than psychology in emancipating itself from its relation to philosophy, and it is still necessary to distinguish the value judgments of the social philosopher, or the moralist, from the empirical statements of the sociologist. The fact that education must have a social purpose, and embodies a set of social values and ideals, has always been expressed in the works of educational thinkers. In this respect Plato, to whom the attention of potential teachers is frequently drawn, was the first educational sociologist. And he was indeed a sociologist as well as a social philosopher, for he not only put forward a scheme for an ideal society, but showed, in fact, how there is always a connexion between a form of government and a type of education, and how the former (whether judged good or bad) is able to condition the latter. Thus it is nothing new to say that one cannot understand the function of an educational system without also being aware of the part played by social forces in shaping, maintaining or changing it. However it was not until the quite recent application of sociological methods of research in this country that any detailed factual information became available of the way in which the social function of education actually operated in our society, whatever its avowed purpose might be. These investigations have been carried out more by sociologists than by educationists. There are many advantages in this, since educational sociology is best regarded as a part of general sociology, and a more intimate part than might be meant by saying it was a separate branch or offshoot of sociology. The emphasis in modern sociology has come to be the study of social institutions and the relations between them. By a social institution in this context is meant the system of organised and quasi-permanent relationships set up in response to a basic social need. The need of any society to bring up and educate its children leads both to the institution of the family and to a whole set of educational institutions, which are interrelated with the institutional structure of the whole society. The educational system of a country presents a rich and accessible natural source of data for the researches of the sociologist; the results of which can contribute to the growth of general sociological knowledge (e.g. with regard to the nature of social change) as well as helping to solve the problems of the practical educationist. The central aim of the educational sociologist can thus be defined as being to study the process of education, and the institutions by which it is carried on, in relation to the economic, political, cultural and other institutions of the society in which it functions.

With this definition in mind we can see the value of the researches which have revealed the relations of education to occupational and social status, and hence the part it plays in social mobility (1). Of no less importance are the studies of the social factors in selection, and the problems of the transition between different stages in the educational system itself, for example from primary to secondary education and from there on to the university or other forms of higher education (2). All the above work is now becoming widely known, and details need not be given in this survey. Its results have certainly thrown new light on the meaning of equal educational opportunity; have shown a clear relationship between scholastic success and social background; and have supplied a factual basis for discussions of future educational policy (3). Next to nothing was exactly known about the relation of education to the movement between the social classes in this country before 1950. Indeed earlier than this there are very few publications which can count as educational sociology of the same *genre*. Reference throughout this paper is made only to work carried out in England and Wales.

THE SOCIAL FACTS OF EDUCATION

The publication of the Crowther Report, "15 to 18", presents us with almost a text-book of educational sociology (4). Volume II of the report consists of a full account of the sociological investigations specially undertaken to provide information for the committee. The first part of Volume I is entitled "Education in a Changing World". Consider a small example of the matter with which it deals. Chapter 3 opens with the words, "Men and women live longer and marry earlier than they used to, but they have smaller families. More married women have paid employment." It then goes on to discuss the educational consequences of these facts. There could be no clearer example of the influence of social facts on educational practice. Again, in making a case for raising the school leaving age the Report shows this is essentially a social problem as well as an educational one. The relation to employment and the occupational structure is stressed. In the national interest it is argued that the demand for skilled manpower and more educated workers in industry must be met, illustrating how education is expected to serve the needs of economic efficiency. We also find the school regarded as a protective environment for the adolescent; being expected to further a moral way of life; and becoming, for the more reluctant pupils, almost a therapeutic community for solving "teen-age" problems. This latter element of guidance represents the social work or mental health aspects of education.

We find throughout the Crowther Report a recognition of the influence of the social background and the cultural pattern on educational achievement, and a confirmation of some of the earlier researches on this subject. This association of the educability of a pupil not only with his basic ability but also with a complex of environmental influences enables us to distinguish psychological facts from social facts. The measured intelligence of a pupil at a given time is a psychological fact peculiar to that individual (whatever may be the cause of it), whereas the chances of this pupil going forward to higher education is a social fact partly determined by the social status of his family group. The scope of educational sociology might well be described as a study of the social facts of education. They are the facts which constitute, and result from, customs, habits, beliefs, ways of life, and which all arise from the relationships between people. They are social facts in Durkheim's original sense of the term, since their source is not only in the individual but also in society, and they tend to bring pressure to bear on the individual from outside of himself (5). The social status of a child, and also his education, are things which he does not choose for himself in the first place. He is born into them, and they may well exercise a constraining influence upon him when he struggles to change them.

In studying social facts we will also have occasion to ask how they came to be as they are. This leads us to another aspect of educational sociology, namely the relation between educational change and other social changes. By looking into the past we can see how educational change has come about in response to social needs, and been determined by economic and political forces. This point of view permeated the work of Sir Fred Clarke, and he opened up many lines of thought by his little book *Education and Social Change*, and by his later work (6). He was very much influenced by Karl Mannheim who may still be regarded as one of the leading theorists in this field (7). It was partly under the influence of these two men that the present writer was led to contribute to the subject of the social determinants of education (8). The same kind of theme was developed by Olive Banks who has shown, with a wealth of detail, how during the present century education in England has tended to follow changes in the social structure rather than initiate them (9). The education which a society provides ultimately reacts to the impact of the new social forces at work, and it is in this way that education becomes a social technique for the reconstruction of society. This approach underlines the importance of the relation between sociology and history. The method can be used with interest, if with fallibility, by attempting to predict the future. An examination of the major trends of social change in our present society might quite reasonably enable us to anticipate some of our future educational needs. The result may be partly a fantasy like Michael Young's *Rise of the Meritocracy*. But this is, at any rate, a work with plenty of serious matter for thought, and represents an idea of society which would appear to be congenial to some people while repugnant to others.

The Boundaries of Educational Sociology

In discussing the scope of a subject of study one must be aware of its limits, and try to define the boundaries between it and other disciplines, even when such boundaries are not clearly marked, or when overstepping them a little does not seriously matter. The boundaries of sociology are notoriously difficult to define. The studies which are most likely to overlap and interrelate with it are social anthropology and social psychology.

Anthropologists have developed the concept of the culture of a society as a way of comparing one society with another by differences in their ways of life or patterns of culture. This idea has been of great importance to the educationist, since it has emphasised the extent to which the child, as well as the adult, is a creature of his social group. The concept of culture has become an integral part of sociological thinking, and all the more so since anthropologists have turned their attention to complex industrial societies like our own, and shown the existence of distinct sub-cultures within the wider society, or indeed within the same town (10). The result of growing up in a city depends on the part of the city in which you grow up. A study of child rearing practices and family life in different cultures is an excellent way of bringing home to students of education the cumulative effect of the social environment. It may be suggested that the sociology of the "teen-ager" is a field of great importance today, and such studies may enable us to deal a little better with the growing gap in understanding between the adolescent and the adult in our society (11).

Another valuable borrowing from social anthropology has been the concepts of status and role. In accordance with this terminology the relations of people within a social group become a complex function of their different statuses with their designated rights and obligations, and the associated role behaviour to which other people expect them to conform. It certainly becomes illuminating when the occupation of a teacher is analysed, and it is seen how many different roles he is expected to play. He is then seen to be at the centre of conflicting expectations which may be expressed to him in turn by the headmaster, the parents, his pupils, Her Majesty's Inspector, the Director of Education, the N.U.T., the political parties and anybody in the public at large. Sociological studies of the teaching profession are badly needed, and are beginning to appear (12). These may give us a clearer idea of the special functions of teachers in their institutional roles, and their status within the general occupational hierarchy.

There is also a need for a systematic sociology of the school, with comparative studies of different schools representing social units of different kinds. The role and function of the school as an agency for the socialisation of the young requires much more explicit definition. What kind of social group is an English school? How does its own internal culture, what Durkheim called "la vie scolaire", correspond to the culture which surrounds it? One has the feeling that nobody knows what goes on in schools, not even those who work in them, and least of all those who work and live in them. It needs an outside observer; it needs the anthropologist visiting the savage tribe.

When one comes to consider the social psychology of education there arises another kind of difficulty with regard to the overlapping of disciplines. It is not so much a question of borrowing concepts by the sociologist, but of deciding what is the difference between social psychology and sociology. There has been of recent years a great concentration of studies on small group analysis, sociometry, group dynamics and the like (13). Many of these groups can be classified as face-to-face groups, meeting together in the same place at particular times. Now the school class is such a small group, and we have to consider whether studies of social interaction within the classroom are not properly in the field of social psychology rather than that of sociology. It depends on the nature of the facts studied. If the facts concern the reactions of particular individuals to the social group then they are psychological facts; but if they concern the structure or nature of the social group itself, or the group in relation to other groups they are sociological facts. Or to put it another way, the social psychologist is concerned with the details of social intercourse, and the ways in which people affect one another when they meet in groups, whereas the sociologist is *not* interested primarily in the behaviour of the individual as such but *is* interested in the socially accepted ways of behaving which members of the group have in common.

For example, if some children in a school class make a lot of friends, and others make few friends, there may be both psychological and sociological explanations of these phenomena. One might distinguish between the "internal" and "external" aspects of the group, as Homans does. If it were shown that membership of another social group outside the classroom, such as a certain type of family, or living in a particular neighbourhood, was a factor determining the friendship choices, then this would rightly be called a sociological factor in the situation. That is why it is suggested that a preoccupation with the details of the social interaction in a classroom group as such is not directly within the scope of sociology, however valuable its results may be, unless it spreads to links with the outside society, or at least with the social structure and climate of the whole school in its social setting. However an analysis of the social life of schools as institutions compared with each other or other social groups would come clearly into the field of sociology.

It may be asked whether these distinctions really matter. There is sometimes a minor practical problem when different lecturers have to decide in which course to treat a certain subject matter. Their real importance, however, is in relation to methodology, when it is necessary to distinguish psychological questions from sociological questions. As a rough criterion it is here suggested that face-to-face behaviour in a small group comes primarily into the field of social psychology (14). When, however, the group has some degree of permanence, which a school class usually has, it begins to develop a social structure to some extent peculiar to itself, but to some extent like other groups of the same kind, with certain regular customs and group norms of behaviour (15). Nevertheless it would still not be called a social institution, in the same sense that an even smaller group like the family would be so called, and we are regarding sociology as primarily the study of social institutions.

THE TEACHING OF EDUCATIONAL SOCIOLOGY

The study of sociology by teachers in training should have as important a place as the study of psychology, and for similar reasons. The practice of education is partly an art and partly an applied science. In so far as education is a scientific process, which is only to say that it attempts to test its results as a means towards certain desired ends, it makes use of the empirical methods of the relevant sciences. The relevant sciences are clearly the human and social sciences, and principally psychology and sociology. Thus teachers are concerned with the results of different teaching techniques, in terms of what is actually learnt, and with the effectiveness of their teaching in relation to the different talents and capacities of their pupils. They should equally be concerned with the effects which their work in schools actually has on the structure of their society, and its bearing on the kind of education required in response to present and future social needs. It is to be expected that any syllabus for the training of teachers will pay considerable attention, in a general way, to a knowledge of the social aspects of education, and this is often dealt with under the heading of principles of education. It is with the extent and scope of this knowledge and the methods of imparting it that this paper is concerned. A group of teachers in training colleges and departments of education recently met together to discuss these matters, and further meetings are planned (16).

It is the view of the present writer that a separate and distinct section of a teacher's training course should be devoted to a scientific sociology of education, on approximately equal terms with the time given to psychology. There is a point of view which holds that at the initial training stage a course in general sociology for teachers might be more useful than specific courses in the sociology of education, and that this latter is better suited to a more advanced stage with practising teachers. No doubt valuable results can be obtained from this procedure, but it does not follow that there is necessarily a clear distinction between what, at first sight, appear to be two different objectives. The alternative approach here recommended is to regard educational sociology much more as a part of general sociology. Faced with a group of intending teachers one would begin on aspects of sociology related to educational topics, as a method of beginning to teach *real* sociology. One does not need first of all to teach "sociology for teachers" and then go on to educational sociology; it is all part of the same process. It also has the advantage of introducing a new subject through the particular interest and future occupational function of the people studying it. Let us compare it with educational psychology. Courses begin with such topics as the psychology of childhood, the psychology of learning or of discipline, and matters which affect the day-to-day practice of the teacher. Thus the approach to psychology for teachers is through the psychology of the child in relation to the teacher and his work. So we should make the approach to sociology for teachers through the sociology of schools as institutions in relation to the working of the social system. It should further be added that the whole field of sociology is so large and complex that some specialisation is necessary and desirable in a brief course, and some principle of selection must be applied to the possible subject matter. Restricting the work to educational problems and studies still makes it possible to show that these are touching on fundamental sociological theory and practice.

In conclusion let us remember that our main objective is to give a sociological awareness of what is actually happening in our society, and to assess, on the basis of evidence, what social means are likely to achieve different social ends. A knowledge of the social behaviour of human beings and what they value is a necessary basis for the further discussion of how they ought to behave, and the ideals they ought to follow. But it cannot alone determine these aims and ideals. The right way to live must still be judged in the light of our moral and ethical beliefs, and these will provide us with the educational ends and values which the social sciences can be called upon to serve.

NOTES AND REFERENCES

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4. "*15 to 18*", Report of the Central Advisory Council (The Crowther Report) (H.M.S.O., 1960).
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6. Clarke, F., *Education and Social Change* (The Sheldon Press), and *Freedom in the Educative Society* (U.L.P., 1948).
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9. Banks, Olive, *Parity and Prestige in English Secondary Education* (Routledge, 1955).

10. There are many works of this kind. The following are quoted as recent examples of work in England: Young, Michael and Willmott, Peter, *Family and Kinship in East London* (1957); Dennis, N., Henriques F. and Slaughter, C., *Coal is Our Life* (1956); Gorer, Geoffrey, *Exploring English Character* (1955); Mays, J. B., *Growing Up in a City* (1954).
11. See The Albemarle Report on the Youth Service (H.M.S.O. Cmnd. 929, 1960).
12. *Year Book of Education*, 1953, on the social position of teachers; Tropp, Asher, *The School Teacher* (1957).
13. For recent summaries of this type of work see: Sprott, W. J. H., *Human Groups* (Pelican Books, 1958); Klein, Josephine, *The Study of Groups* (1956); Richardson, J. E., "Group Dynamics and the School", *Brit. J. Educ. Studies*, IV (1956), No. 2; Cartwright, D. and Zander, A., *Group Dynamics* (1954). For an account of educational experiments with sociometry: Blyth, W. A. L., *The Sociological Review*, Vol. 6 (July 1958), No. 5, and *Brit. J. Educ. Studies*, 7, No. 2, 1960.
14. It should be noted that in American text-books these matters are frequently treated in works of educational sociology. In Brookover, W. B., *A Sociology of Education* (1956), which is a typical example, a large portion is devoted to what might reasonably be called social psychology. Another of the best American books is Cook, Lloyd and Cook, Elaine, *A Sociological Approach to Education* (1950), which has a chapter on "Group Dynamics in the School".
15. These matters are admirably treated by O. A. Oeser, in *Teacher, Pupil, and Task* (Tavistock Press, 1955), and his book is clearly described as "social psychology applied to education".
16. In September 1959 a Conference on Educational Sociology was arranged by the Institute of Education of the University of Leicester. A brief report of this has been privately circulated. The main discussions concerned the extent and scope of the teaching of sociology in training colleges and departments of education. There is also a sub-committee of the British Sociological Association which is collecting information on the same topic, and which held a meeting during the Conference. A group of northern university teachers held a follow-up meeting in Leeds in December 1959.

SCIENCE IN THE GRAMMAR SCHOOL

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I. SCIENCE AS A SCHOOL SUBJECT

SCIENCE as a school subject is a comparative newcomer. It has not the living tradition behind it that classics and mathematics enjoy.

It has had to make its way, first as a somewhat odd pursuit for those who did not take kindly to classics, then as a useful subject for those who might need it in after life; and it is only quite recently that it is becoming increasingly evident that in the modern world it must be a part of culture for all in the same sense as our history and literature. It is now no longer a mark of superiority to confess, "I am afraid I know nothing of science."

To begin with, science was considered hardly to provide the material for consideration by the highest type of mind and this attitude still persists. The headmaster of one of our most famous public schools said quite recently that his scientists worked under somewhat of a disadvantage in that they were not in close contact with the "intellectual élite of the school".

It would now, however, be generally conceded that science can extend to the full the most active intelligence; indeed in its higher branches, and notably in physics, it demands a power of dealing with abstractions hardly equalled in any other subject. It is now thoroughly respectable intellectually.

The teaching of science should be based on experiment or observation and it is in relation to the associated practical work, particularly that performed by the pupils themselves, that science has made a unique contribution to education. It introduces the pupil to an entirely different way of "knowing" from that common in other subjects, where knowledge is gleaned mainly from books. Books, of course, have their place in science teaching but the information obtained from them and from the words of the teacher is regarded as information acquired from more or less reliable authority and not as knowledge acquired by a scientific technique.

To be effective, however, practical work must be well done. It makes considerable demands upon equipment and upon teaching skill and time. In many grammar schools to-day, it must be confessed that the situation regarding practical work is far from satisfactory, particularly among the younger children. Classes are too large, laboratory space is inadequate, apparatus is in short supply and rarely is there to be found well-trained laboratory assistance. Much has been said and written about the shortage of teachers of science and this is perhaps not the place to argue the causes of the shortage and the remedies to be applied; but good teachers will demand good conditions and, if the right kind of men and women are to be attracted, they must be provided with the opportunities of carrying on their work to the best advantage. Science is a subject that is expensive in time, equipment and teaching power.

Science is a continuously growing subject and the rapidity of its growth has been a remarkable feature of the first half of this century. This is what makes its study so exciting. But it does cause difficulties where the content of the science curriculum is concerned. The volume of scientific knowledge is increasing but there still remain only twenty-four hours in the day and seven days in the week. Although in many schools science does not yet receive its fair share of teaching time, in general there is little possibility of a substantial increase. It follows, therefore, that if school science is to be kept up to date, syllabuses must be constantly under review: some topics which were of considerable importance in the nineteenth century must give place to others of greater importance in the twentieth. This sounds an eminently reasonable view but to give effect to it in practice is by no means as easy as it sounds, as anyone who has had experience in the revision of science syllabuses will testify. It is comparatively easy to suggest new topics for whose inclusion a strong case may be urged; but when it comes to deciding which of the older topics are to be omitted to make room for them, the problem is much more difficult and general agreement not at all easy to secure. This has given rise to the tendency for the content of all science syllabuses to increase and constitutes the great problem facing teachers of science to-day.

2. AIMS OF SCIENCE TEACHING

Before any discussion of the content of syllabuses we must be clear as to the objective of science teaching in schools. There are three main reasons which may be urged to justify the inclusion of any subject in the curriculum:

(*a*) utilitarian or vocational: it may help pupils in their everyday life or may be directly useful to them in their future careers;

(*b*) disciplinary: it teaches pupils to think;

(*c*) cultural: the subject-matter is an essential part of our social heritage.

With regard to (*a*) it is undeniable that a knowledge of science is useful in everyday life, yet so many pupils get along with little or no knowledge of this kind that this cannot be said to be a compelling reason for including science among school subjects. The vocational aspect, however, is of greater importance. During the last twenty years the demand for scientists and technologists of all kinds has increased enormously, and a considerable number of pupils now leave school to become scientists or enter some occupation for which a knowledge of science is necessary. Indeed our national prosperity depends upon the supply of scientists and technologists of the right type and it is the duty of the schools to assist in this matter so far as they are able. It is, however, generally held that the preliminary to vocational training which it is in the power of the grammar school to impart should not commence below the sixth form. What is important is that the pupil's first introduction to science should capture his interest and inspiration and not lead to boredom.

As to (*b*), it will not now be denied that science can provide an intellectual discipline at least as thorough as that to be gained from a study of the classical languages or mathematics; indeed it may have some unique features in this regard. It has been urged that the study of science develops certain powers of clear and rigorous thinking, logical deduction and accurate observation. This may well be, but how far these most desirable habits will be generalised and applied in the wider aspects of life is by no means certain. The possibility of this "transfer of training" is now known, by experimental evidence, to be far less than had formerly been supposed. The comfortable doctrine that it does not matter what is taught, provided it is difficult and is taught thoroughly, can no longer be held. What is indeed clear is that no matter should be included in a syllabus merely for the sake of the training it gives. This does not, of course, mean that the disciplinary value of science is unimportant. On the contrary, it must be the conscious aim of the teacher to inculcate in his pupils and to transfer to their general outlook those aspects of the scientific discipline which are of general application, such as, for example, accurate observation, the reliance upon experiment rather than mere authority whenever possible, and the dispassionate weighing of evidence before coming to a conclusion.

It is the third reason advanced for the inclusion of science in the curriculum, namely, the cultural value of the subject, which is perhaps receiving the most attention to-day. It must be remembered that at school, children should undergo carefully selected experiences which will be of value to them both immediately and in after life. They will become full members of a society which had developed particular modes of thought and language in which its ideas and beliefs are expressed. While the Western peoples have evolved very great literature and art, it may be held that their peculiar genius has been the development of a national science which in its achievements, both technical and purely intellectual, is far in advance of anything that has preceded it. No-one can be called truly cultured who has not been brought into contact with this great adventure and whose imagination has not been stirred by it.

3. CONTENT OF THE SCIENCE SYLLABUS

If this view of the function of science in general education is accepted it must profoundly influence the way that science is taught and the content of the syllabus. It seems evident that the courses must be arranged in as liberal a manner as possible and that they must cover a wide range, at least in the earlier stages.

It was considerations such as these which led the Science Masters' Association to initiate in 1920 the idea of "general science" or "science for all", a movement which has had a great influence on the teaching of science in schools. The main recommendations were firstly to emphasise the relation between school science and everyday life, and secondly to broaden the basis of the teaching which had hitherto been almost exclusively confined to the physical sciences in boys' schools and the biological sciences in girls' schools.

Inevitably this has intensified the controversy always in existence between breadth and depth in science teaching and general science has had and still has its critics. It is unfortunate that general science has in some quarters become associated with the idea that science is a unified whole and must be taught as such. This has no place in the thought of the Science Masters' Association. Indeed they recognise that the division at some stage into the traditional physics, chemistry and biology is both natural and inevitable if progress is to be made as is shown by the definition in the *Report on the Teaching of General Science*: "General science should therefore be a course of scientific study and investigation which has its roots in the common experience of children and does not exclude any of the fundamental sciences. It seeks to elucidate the general principles observable in nature, without emphasising the traditional division into specialised subjects until such time as this is warranted by the increasing complexity of the field of investigation, by the developing units of the separate parts of that field and by the intellectual progress of the pupils" (1). Some critics have urged that general science is not a suitable foundation on which to build the somewhat specialised work in the separate sciences of the sixth form. Against this others have not only found it a satisfactory basis for sixth-form work, but claim that pupils have benefited from the broader outlook encouraged by general science. It is very questionable as to how far work in the sixth form should be allowed to influence the work of the middle school. Certainly from the point of view of the pupil who will not ultimately take science in the sixth form, the inclusion of matter which can only have meaning when completed in an advanced course is indefensible. This in turn raises the whole question of specialisation at school about which so much has been spoken and written. When specialisation is mentioned in this connexion it is usually specialisation in science which is implied as this is supposed to have specially deleterious effects, whereas, of course, any strictures should apply equally to all subjects. Be that as it may there can be no doubt that excessive specialisation can be an evil and must be carefully guarded against. It has been suggested that there should be no sort of specialisation at all in schools, that the curriculum should be of a uniform width throughout; but the majority of teachers would agree that some limited concentration of studies is natural and right at about the age of sixteen. By that age, the pupil knows in which general direction his interests and aptitudes lie and it is reasonable that he should be allowed to go deeper into certain aspects of his studies than into others. But this concentration should never be allowed to become exclusive. Most teachers of science are aware that, while a knowledge of science may be properly claimed as part of the equipment of a cultured man, there are fields of experience into which it cannot enter, and that these affairs of the spirit must be cultivated alongside the abstractions which are the subject matter of science. It has been said that the time given to the more general studies in the science sixth form is often a time-table fiction and that an inordinate amount of time is spent on specialised study of science. In defence, teachers have urged that the demands of universities in their scholarship examinations are such as to necessitate that every moment of a pupil's time that can be spared shall be devoted to his science work. It must be admitted that there has often been considerable force in such arguments, especially as applied to the colleges of the older universities. The bad effects of such demands upon the schools are obvious. Not only do they encourage the degree of specialisation which none of us wishes to see, but they can spread downwards below the sixth form and sometimes result in the work in the middle school being conditioned by future scholarship requirements. Happily, this situation is more of the past than the present. Many examining bodies restrict the factual content of their scholarship papers to that of the Advanced Level and in the Oxford and Cambridge colleges much more attention is being given to the level of general education of the candidates.

The neglect of science in the arts and classical sides of sixth forms is as regrettable as the excessive attention which is sometimes devoted to it in the science sixth. The kind of science which should be taught to arts students as a part of their general education is beginning to receive the attention it deserves. It would seem that it should not be merely a small portion of specialised science but a more general scheme which should show the development of some of the major concepts of science and their social consequences. It would seem desirable also that such a course should contain some reference as to the nature of science and its relation to thought in general. Such a course might well be given to the sixth form as a whole, including the scientist. Knowledge of its content is by no means automatically acquired during the study of a branch or branches of science. Indeed, it is not common to find among recruits to the teaching profession a young scientist who has knowledge or interest in the history of the development of his subject or its philosophy. Few universities give sufficient attention to such matters, with the result that the purely technical aspects of science are unduly emphasised and a similar attitude is fostered in the schools by the graduates who teach in them.

4. The Future of Science in Grammar Schools

How should the teaching of science in schools develop in the next few years? It is of the greatest importance for the future of the country and of scholarship that the right decisions are taken now.

In this connexion a recent statement of policy by the Science Masters' Association (2) is of great interest and should receive the careful attention of all concerned. It contends that science must be presented "as part of our common culture and humanistic heritage" and "be taught in harmony with, not in opposition to, the various arts subjects which alone have hitherto been regarded as humanities". It is maintained that "science should be regarded as a central or 'core' subject in the same way as, for example, English and mathematics are at present and as classics used to be". It recommends "that *all* pupils should follow the same course in science up to the end of the fifth-form year" and further that *all* sixth-form pupils should follow a course in science of a humanistic and cultural nature whether or not in addition they are specialising in science.

All these recommendations are very much in line with the discussion in the earlier part of this article. The statement proceeds to recognise three stages or "phases" in grammar school science education.

> "I. Introductory phase, covering the first two years of a grammar-school course.
> II. Intermediate phase of three years up to about sixteen years of age.
> III. Advanced (or sixth-form) phase."

It then goes on to indicate the type of work and treatment appropriate to each phase. For phases I and II the emphasis is on generality; the course should cover "at least the three main subjects of school science". For phase I, the introductory phase, it is suggested that the teaching should be based on the topic method and that it should be in the hands of one teacher only. For the intermediate phase there is no insistence on the one teacher, but a recommendation that "the total time devoted to the science subjects should be the same for all pupils in a school irrespective of their intentions regarding future specialisation". If this recommendation were put into effect it would have the most desirable result of putting an end to any specialisation below the sixth form. It is most interesting that such a recommendation should have the authority of the committee of the Science Masters' Association behind it since most, if not all, of its members are actively engaged in sixth-form teaching. The statement is, however, silent as to the proportion of school time which it is reasonable to expect should be devoted to science in the introductory and intermediate phases, and as to where any necessary additional periods are to come from. Yet these are vital points.

With regard to the third or advanced phase, two courses of study are envisaged, A and B. Course A is intended for *all* pupils in the sixth form whether arts or science specialists. It should embrace "the history and philosophy of science, its present-day social and technological consequences and its future possibilities". Course B comprises the kind of work at present being done in science sixth forms.

The idea of a course similar to A as being given to all members of the sixth form has been mentioned earlier in this article and it is hoped that this will receive ample support. To separate the history and philosophy of science from its more technical aspects would be a wise move. The latter are absorbing and exciting to the pupil and any holding them up to discuss historical matters is apt to excite impatience. As regards the more usual sixth-form science studies in Course B, it is appreciated that if the recommendations are carried out, it will not be possible to cover completely the whole of the syllabuses as at present set out. To begin with, if the work in phases I and II is such as can be given to *all* boys it is most probable that the science specialist at the beginning of his course will have a rather smaller factual knowledge on which to build. Courses A will also be time-consuming. The vital matter upon which all these proposals rest is the reduction in the factual content of the syllabuses in science at present in use for the advanced level examinations. The Science Masters' Association has wisely set its face against a reduction in the number of Advanced Level subjects presented and a consequent narrowing of the field of specialist work, but will seek curtailment in each separate subject. Suggestions for this, we are promised, will form part of a future report and these will be waited with interest.

In the long run it is not the science teachers themselves who will decide as to the desirability of making science a "core" subject as suggested but the head teachers of the grammar schools, many of whom will need to be persuaded of the position of science as an essential element of modern culture and the possibility of its being taught as an active humanity. The importance of the teacher in such a scheme can hardly be overestimated. What we understand by "culture" is much more "caught" than taught and the most carefully thought out syllabus can become a dreary catalogue of facts if not presented by one with the necessary breadth of interest and vision.

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ACADEMIC LEARNING IN A MODERN SOCIETY

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THE society we live in is undergoing a number of large-scale changes in structure and outlook which carry the profoundest implications for teachers. They may be briefly sketched as follows. First there is a general trend towards increase in scale of most organisations and communities. The proportion of workers who are employed in large firms steadily increases; the populations of large towns are continually rising. One result of the trend appears to be greater centralisation of control and responsibility; a greater sense among the rank and file of being only minute cogs in a vast machine. Another result is the loneliness and isolation that are increasingly found in cities and their suburbs.

The second social change to be noticed is the re-distribution of power in the world at large as between the traditionally more and less privileged parts of the human race. Within Western societies the political parties and trade unions that represent the interests of the lower income groups have greatly increased their power over the last 50 years; in the world as a whole the less advanced countries have conspicuously greater political and economic power vis-à-vis the Western countries as compared with 20 years ago. The re-distribution of power has been accompanied by a widespread and diffuse but nevertheless profound change in attitudes to authority. In general, people everywhere appear readier to challenge the credentials and the pronouncements of those in positions of command; persons in authority correspondingly have less confidence in the validity of their decisions and the exercise of their power. It may be said that this is no more than the perennial reaction of the under-dog to the over-dog; but there is no doubt about the shift of power within Western countries over the last 100 years and in my opinion this reinforces and stabilises the under-dog's protest.

Associated with the change in attitudes to authority is a challenging attitude to traditional interpretations of life and morality. Much confusion exists in people's minds both on questions of religion and on matters of values. It may be argued that such confusion has always existed; but in this country the religious revival of the period from 1810 to 1860—illustrated by the un-respectability of agnosticism in educated circles around 1860 and the rather high level of church attendance at that period—has by contrast left the country very conscious of its present uncertainties on ultimate questions of values and obligations.

Finally we must also note what is in my opinion a new feature in the outlook of men all over the globe: an expansion of the horizons of thought, a widening consciousness of the potentialities of human life not only in material amenities and in the control of nature but in the expansion of personal freedom and self-direction. (1)

There are, in short, complex changes in social structure and in attitudes and values taking place in Western society, which pose important questions to all concerned in education. They are accentuated in Britain by the peculiar economic situation: a much larger proportion of our national income is derived from foreign trade than in any other country (2) and we are therefore much more vulnerable to world changes in prices and more dependent on the adaptation of our export trade to world needs. In such a society it is important for education to preserve or encourage in the community at large a widespread initiative and sense of moral and social responsibility, which can cope effectively with economic adaptation and social and political upheavals. The above qualities embrace certain habits of thought, and it is these that I wish to select for particular consideration on the present occasion. These qualities of mind are four: a habit of independent thought, of judging for oneself; a soundness of judgment, or realistic sense of perspective; a habit of reflecting on one's experience; and an ability to apply the information learned to the perpetually fresh situations of life.

The whole structure of education in this country suffers from a heavy bias towards the mechanical memorisation of facts, concepts and techniques without reference to the wider reality, human or inanimate, from which they are abstracted. This is a somewhat sweeping generalisation but there is a good deal of evidence to support it. First I have habitually discussed with training college students the nature of the work they have done at their grammar schools. One receives almost universal reports of the predominance of factual instruction at O-level, with rather less insistence on it at A-level. These reports are confirmed by the fact that we find the men's own habits of study and of teaching are through and through impregnated with the assumption that education means factual instruction. Such data are not statistically balanced but they are echoed by lecturers in other colleges.

The second sector of evidence is the predominance of factual questions in O-level examinations. A recent O-level paper on a Shakespeare play was 100% factual: not a single question required more than the memorisation of facts; none demanded the exercise of judgment or imaginative understanding. Now it has been forcefully argued that novels and plays and poems become recognised as "literature" primarily for their understanding of human character and relationships, for their moral insight and for their revelation of the quality of human experience; yet in the examination paper referred to, the very essence of literature was denied. Even the recent report of a more enlightened Board writes: "the examiners . . . look for close knowledge and understanding of the text, for relevant selection and accurate reproduction of material . . . and above all for an answer which does, in fact, answer the question. If, *in addition*, the candidate has developed the capacity to form views of his own and can express them, so much the better; but even without this power, he can still achieve a pass by the exercise of diligence in studying his text" (3). It is evident that the candidate's expressing of his own appreciation and imaginative insight is given a minor position.

A third item of evidence is the recent report of the University Grants Committee which castigates the universities for the frequent cramming of half-digested facts and second-hand ideas into students' heads. The following passage puts the point:

> The danger, at a time when the volume of available knowledge even in narrow fields is so enormous, is that the utilitarian purpose of the special subject will drive the student to memorise as much as possible of the knowledge in the limited time available, leaving him with no time to develop his power of thought or to acquire any knowledge outside this subject. We fear that the drive to acquire a maximum of specialised knowledge to the exclusion of other things is too often abetted by the teacher, himself perhaps the victim of excessive specialisation. It is certainly encouraged by the importance which over-frequent examinations are allowed to assume in the student's mind during some university courses. (4)

Whitehead made similar comments 30 years ago:

> It is a convention to speak of mere knowledge as of itself imparting a peculiar dignity to its possessor. I do not share in this reverence for knowledge as such. . . . If you have much to do with the young as they emerge from school and from the university, you soon note the dulled minds of those whose education has consisted in the acquirement of inert knowledge.

> . . . In my own work at universities I have been much struck by the paralysis of thought induced in pupils by the aimless accumulation of precise knowledge, inert and unutilised. (5)

What I am arguing, then, is that a great deal of what goes on in schools, colleges and universities does nothing to cultivate the habit of independent thought, or sense of perspective, or reflection on experience, or the application of knowledge in fresh situations, and that in our society, where far more is left to the good sense and judgment of the ordinary man than in the past, and where the health of the country depends on his wise and responsible initiative, the capacity for sound thought is of major importance.

It is worth while to speculate briefly on the causes of this habitual over-emphasis on fact in modern education. Undoubtedly one of the most valuable benefits of a long academic education is to foster the desire for precision, the respect for fact, the wish for an all-round picture, the demand for objectivity. Yet the practical result is a travesty of the ideal. One contributory cause of the discrepancy, very possibly, is the authoritarian element that exists in our tradition. More important, probably, is the increasing demand for equality of opportunity over the last 50 years, expressing itself, in a scientifically advanced society, in an expectation that public examinations shall be "objective". Another contributory cause is probably the social revolution which has raised the aspirations of members of the lower income groups and accentuated the competition for higher education. Thus the values stated have come to express themselves in an over-insistence on the mastery of fact, and in two assumptions: that one cannot begin to form views or exercise judgment until *after* one has learned the facts; and that one gets an adequate grasp of facts by being told them. As a consequence one finds the university lecturer cramming his students because they must get hold of the facts before they begin research; A-level teachers cramming their pupils because they have to master the facts before they get on to S-level; O-level teachers likewise; junior school teachers for the 11 + ; and even Infant school teachers for the junior school. If the consequences were not so disastrous the picture would be comic.

The first of the assumptions just mentioned is demonstrably false. In ordinary life one normally exercises one's judgment *in the process of acquiring* the facts. One moves, for example, to a new job and looks for a new house; the choice of house is a matter of importance; as one goes round the desirable residences offered by the agents there is a constant interplay in one's mind between the observation o fact and the exercise of judgment. At the end one sits down with list of the most suitable houses and draws up a balance sheet; th perpetual failure of academic education is to press the pupil to bypass the personal visits, to take his facts from the agents' blurbs, and to leap direct to the stage of deduction, without recognising that his final judgment is invalidated by the "phoney", unreal, premisses.

It is interesting to compare the process with different approaches to the teaching of science. One schoolmaster begins a new topic by throwing up a question which arouses the spontaneous interest of his pupils: for example, why does an iron ship float? He then presents a series of demonstrations with a spring balance, an overflow can, and a number of weighted wood blocks, as a result of which, by recording of the readings and judicious questioning of the class, he brings the children to form for themselves, more or less, the generalisation known as Archimedes' principle. A teacher whose aim is exclusively the inculcation of facts and the passing of examinations is apt to begin by announcing the principle, with or without illustrative demonstrations. In the one case the teacher is helping his pupils to look and think for themselves, and to get a direct sensory experience of the material objects about which the problems revolve, in the other to memorise verbal formulae.

In the arts subjects the approach may be rather different. An important part of history is made up of the stories of important individuals and their relationships, with the interplay of good and evil. A teacher whose primary aim is to make an impact on his pupils' imagination, so that they enter into the spirit of the people and periods under consideration, will make use of such techniques as class mime, historical films and school broadcasts to translate this material into vivid concrete experience at the children's level. In such cases he is not asking a question to which an answer is to be found but attempting to create some imaginative understanding of past events in the children's minds, making it part of their mental furniture, so that when they see the Nelson column for the first time, they do not regard it as just one more pile of stone with a one-armed man on top, but can recapture the nation's extraordinary affection for Nelson and the audacity of his victories. It is sometimes said that this imaginative response is not possible for any but the exceptional child. The evidence available, however, indicates that in so far as the statement is true it reflects not the child's nature but the teaching methods used. It has been shown in a carefully conducted experiment (6) that children taught history and poetry by the use of mime and other active methods are far better able to use this material in a fresh setting—for example in writing a fictional story about the characters involved—than those taught by more conventional methods.

Another important element of history is the study of the varying conditions and quality of life down the ages. Some of this material can be made more real to children by visits to ancient buildings or to museums. The teacher discusses with the class in advance what they are going to look for and before giving any instruction on the spot expects the pupils to make their own drawings and notes to answer the prepared questions. Perhaps on their return they make models of the building visited and of others comparable. The emphasis is again on the pupil's observing and judging for himself while he is getting his facts, and on his acquiring some sense of the "feel" of the period under study.

These examples bring us to the heart of the teacher's problem. Three vital issues are raised. First: do the children learn the facts adequately this way? Second: do they learn the concepts, the structure of thought of the subject? Third: in what sense can it be said that children ought to build their academic knowledge on "experience"?

First: do they learn the facts? The experiment already referred to showed that the three classes subjected to the different teaching methods gained approximately equal scores on factual tests a month later, provided that the miming group had adequate consolidation of the material. It appears that specific provision must be made for memorisation of dates, definitions and so on. This is an important point; but it limits the meaning of the word "fact" to items of information that are expressed precisely and probably verbally and represent a high degree of abstraction from the total scenery of events. An imaginative awareness of Nelson's personality or of the style of the contemporary Georgian buildings may represent a deep appreciation of facts which gets no credit in the ordinary examination.

Second: do the children learn the broad concepts, the structure of relationships in the subject, equally through the different methods? —for example in a topic like the development of the Industrial Revolution or the theoretical basis of Archimedes' principle? This is not an inevitable occurrence by any teaching method. But from my own observation I consider that the teacher who gives much attention to providing his pupils with vivid first-hand experience is apt to suppose that they will see its significance for themselves, with the result that he neglects to analyse it in terms of principles. I find this particularly true myself in my work with students. I give them a variety of learning exercises—in studying the processes of learning—and regular work with small groups of children and I find it takes considerable skill and time to enable them to discern the various conclusions one can legitimately draw for ordinary classroom work. I suspect that a similar obstacle arises in General Education at the sixth form level, where one is attempting among other things to bring the pupils to grip with the basic issues of human life; if one uses a visit to a factory or a cinema as a lead-in it requires a good deal of skill to draw the discussion on to the major questions. In short the teacher must make specific and adequate provision for each sector of learning: for the memorisation of facts, for the mastery of techniques and for intellectual analysis as well as for adequate first-hand experience. Whitehead used to suggest that the teacher needed to arrange a rhythm or alternation of the phases of fresh enjoyable experience with those of severe effort.

In what sense, then, can it be said that academic learning of the kind already described requires to be built on "experience"? What is meant by "experience" in this context? In the example from elementary physics there is no ambiguity: the teacher enables the class to see and handle the wood blocks and spring balances for Archimedes principle. But the history master cannot give his pupils direct experience of Nelson's life or the Industrial Revolution. And what sort of value does the average child's unselective experience of Sir Winston Churchill have now—the glimpse in the procession, the fragment on television? What sort of difference is there, then, between the "experience" of seeing Churchill on television, of seeing a historical film about Nelson, of hearing the memorable school broadcast on the arrival of the news of Trafalgar in England, of re-enacting in classroom mime a few events of Nelson's life, of hearing a brilliant teacher tell the story, of seeing a filmstrip or set of pictures on Nelson, and of hearing or reading the story in a dull pedestrian form? The children undergo some sort of "experience" in every case: in all their lessons they get (one hopes) at least a faint awareness of the topic of the lesson. What are the defining qualities of the "experience" which will make possible the kind of academic knowledge I have described? The distinguishing features of such "experience", I suggest, are two: a keen sense of personal interest on the part of the pupil; and a keen sense of the existence of an important "meaning" in it for himself. The sense of interest and the sense of meaning are two facets of a single thing: the pupil is not necessarily emotionally excited but he has a strong impression that here is something of personal value for him.

These two criteria serve to distinguish the useful activities and experiences both from those which are so dull that the pupil never wakes up to them and from the adventitious excitements that occur in badly conducted activities—such as miming which emphasises trivialities or an expedition where the children do not know what they are looking for.

The range and intensity of meaning found in such experiences are governed by four factors: on the extent to which they engage the spontaneous interests or drives of the pupils; on the pupils' level of intelligence, which affects the extent to which their minds are habitually making connexions and noticing relationships, and thus building up "meaning", in the ordinary business of living; on the preparation given by the teacher, which can awaken his pupils in advance to important aspects of the experience or to relevant questions; and fourthly on the follow-up, in which further implications of the experience may be explored and expressed.

It follows that the value of such vivid experience, suitably handled, is fourfold. In the first place it gives a sense of reality to the theoretical problems or principles involved, without which these are sheer parrot-learning or verbalism, or as Whitehead called them, inert ideas. It is relevant to recall William James's story of the woman who visited a school class one day and after hearing what the lesson had been about, asked the class a question: "If you dug a very deep hole, right down into the inside of the earth, would it be hotter at the bottom than it is up here?" The children were dumb; they had no idea. Embarrassed, the teacher interposed and asked if he might put the question in another way: "Now children, in what condition is the interior of the globe?" Without hesitation they replied: "The interior of the globe is in a condition of igneous fusion" (7). At a more mundane level, most teachers have probably met children who can recite verse or perform computations without having the slightest insight into what they are doing or any awareness of the reality that lies behind the symbols.

A second contribution is the training of the pupil to observe and think and interpret for himself as he undergoes the experience. In the third place he is stimulated to reflect on his experience, to cast around for its wider or deeper implications. And fourth he is better able to apply the learned material to new situations. In short the pupil is beginning to establish a habitual interplay between thought and action, between abstract ideas and concrete experience, in virtue of which each can illuminate and correct the other.

It may be argued that what I have been describing is simply good teaching, good instruction. Such a phrase, however, conceals an ambiguity, for one's judgment of what is good varies with one's scale of values. Teaching that is "good" for a regimented society will produce a mind that is too blinkered and unadaptive for a fluid, open society. What I have been doing is to try to disentangle some of the components of classroom method and the ends or values they serve. I have attempted to show that if we wish the rising generation to use their minds with some degree of independence and realistic judgment we must re-model our work in such a way as to develop those habits in the course of the classroom routine itself.

A final point. One of the gravest obstacles to enlightened work is the dominance of the conventional public examination, which puts an overwhelming premium on "swotting"—by which I do not mean hard work but mechanical memorisation. This is not exclusively the fault of the examination system; it is partly due to the intensity of competition for university places. But as it is, the examination system has become an instrument for promoting the worst faults of the academic world, the deadest kind of authoritarian instruction. If the sort of learning I have described is to be extended it is imperative that the examination should be converted into an instrument for encouraging that kind of learning. This means re-modelling the papers. The first step would be to introduce a few questions so framed as to give an opportunity to candidates who have been taught by enlightened methods. Some O-level and A-level papers do achieve this. Eventually the questions should be so devised as to preclude the success of the mere swotter. This is true now of the General Studies paper at A-level of the Northern Universities Joint Matriculation Board. Few educational tasks in my opinion are more urgent than the creation of an examination system which will encourage rather than inhibit enlightened academic learning.

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A PIONEER OF SCIENTIFIC EDUCATION
GEORGE COMBE (1788-1858)

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When the materials for this great task (the first comprehensive exposition of the Science and Art of Education) contributed by a long succession of eminent workers in this important field of inquiry, from Plato to Payne, are gathered up, George Combe's studies and exertions will be found to have been of sterling worth. And when the true history of education—a subject that concerns mankind as well as the teacher—comes to be written, he *will* receive his well-earned place beside the greater reformers of education, and a special position among the smaller band of its scientific students (1).

SEEMINGLY our histories of education are not altogether "true"; Combe is not mentioned in Barnard or Curtis, and Adamson has only an incidental reference to him, though Archer gives him two pages. Granted, a biographer or editor is inclined to overvalue his subject, and Jolly has probably done this here, but still Combe's achievement is considerable, and he is worthy of more attention than he has yet received. For in his writings one may find some of the ideas, already fairly well developed and intelligently argued and illustrated, which were, in the eighteen-sixties and eighteen-seventies, to form the staple of the momentous debate, led by Spencer, Mill, Huxley and Arnold, about the content of education. And the outcome of that debate—the relegation of the conventional classical course to a position of lesser importance, the introduction of science and subjects likely to produce understanding of causality and rational habits of mind, and the development of training for the aesthetic and affective faculties through artistic and social studies and notably through literature, especially English—had been, more or less, foreshadowed by Combe.

George Combe was born in Edinburgh in 1788, and educated at the High School and at the University, Edinburgh. In 1816 he met Spurzheim, and began to apply himself to the study and advocacy of phrenology, writing books and articles and founding phrenological societies and journals. An interest in the educational implications of phrenology led him to a sustained examination of the whole field of education and to many proposals for important changes and extensions in education. In 1836, after an unsuccessful application for the Chair of Logic and Metaphysics in Edinburgh University, he retired from business as Writer to the Signet in Edinburgh (he had followed the legal profession since 1812) and devoted most of his time to phrenology and education. He assisted Wilderspin in the foundation of infant schools, and became a leader of the movement for a system of non-sectarian national education in Great Britain. From 1838 to 1840 he toured and lectured in America, and spent much of his later life in Germany, Switzerland, France and Italy, investigating social and educational systems. He was constantly busy on behalf of the causes he had at heart, speaking, lecturing, and writing articles and books. He died in 1858.

Combe did not write a systematic treatise on education but he produced, between 1826 and 1855, many articles and speeches on the subject. All of these of any value, however slight, were carefully collected by Jolly and are to be found in his bulky edition of Combe. From this it is clear that first of all Combe, like Spencer, Huxley and, Arnold (2), constantly insisted on the necessity of education for everyone who is to attain true humanity and happiness. Man "MUST BE EDUCATED" he says, and education means

> the process of acquiring that knowledge of our Creator, of ourselves, and of external nature, and the formation of those habits of religious, moral and intellectual enterprise and activity, which are indispensable to the evolution of all our faculties, and to the performance of our parts, with intelligence and success, in the world (3).

Without education (Combe continues) man's intellect and moral sense are stunted while his unwholesome appetites flourish unregulated; he is a menace to himself and to his neighbours: "To send an uneducated child into the world is little better than to turn out a mad dog or a wild beast into the streets" (4). Nor is the right to education to be restricted: "The working-classes are God's creatures, and are as well entitled to justice as the higher ranks" (5). Great improvements will follow from universal education: it will make each individual's work and leisure both more profitable and enjoyable, and it will have undoubted social advantages, eradicating waste, poverty and disease, welding society harmoniously, and enabling the masses to use beneficially the power gradually being extended to them (6). Granted such a consummation,

> individuals would meet with common principles, with minds teeming with ideas, and sentiments glowing with emotion . . . all would possess common objects, in the improvement and expansion of the intellectual faculties, and the gratification of the moral feelings; they would possess common principles,

> in the philosophy of external nature and of the human mind, in a common language, and, in short, each could bring his share of entertainment and instruction to the common banquet (7).

Regarding the process of education Combe makes an important distinction between training and instruction. Training is the proper development of all human faculties; instruction is the communication of knowledge. Instruction is just one aspect of training, a means to an end; but, unfortunately, in the past, instruction has been regarded as more important and training overlooked. Similarly, knowledge is divided into instrumental knowledge and positive knowledge; instrumental knowledge being merely a means to the acquiring of positive knowledge; yet, again, unhappily, in the past, attention has been concentrated on instrumental knowledge. The conventional school courses have provided only instrumental instruction, while positive knowledge and its corollary, training—synonymous with true education—have been neglected. Children have been brought *to know* what is instrumental, instead of being trained *to do* with what is positive.

Combe (along lines later to be followed by Spencer and Huxley (8)) is, of course, attacking the predominance of the classics. They, along with languages and mathematics, are instrumental subjects of instruction. Their main value is the access they provide to the subjects of positive value—the sciences: medical, natural, social and moral sciences. "Res non verba quaeso" Combe's motto reads, and he declares:

> By the common selection of studies little knowledge of *things* is communicated, and children are compelled to learn difficult, copious, and obsolete languages—to burden their memories with *words* corresponding to which they have no ideas (9).

More cogently than Spencer, and before Spencer, Huxley, and the Liberal Essayists of 1867, Combe makes a convincing case against the classics; a case which the Report of the Clarendon Commission substantiates. He demonstrates that the conventional curriculum, with its stress on philology and grammar and its neglect of literature and the physical world, stands in the way of the spread of useful knowledge, that it is neither effective as a mental discipline nor desirable as a source of moral improvement or example, and that it is by no means necessary for the understanding of English. Clearly, Combe affirms, in a passage moderately echoed by Huxley thirty years later (10), the classics have had their day as the staple of education and should be replaced by English:

> There is now no knowledge relating to the physical and moral worlds contained in these languages, which does not exist clearly expressed in English; and there is no mode of feeling or of thought subservient to the practical purposes of life, that may not be as forcibly and elegantly clothed in our native language as in them. . . . England could long ago boast of a Bacon, a Shakespeare, a Milton, a Newton, and a Locke; and she is now able to exhibit an additional list of names, so splendid and extensive as almost to defy repetition, of men who have embodied in her language thoughts and inventions so profound, admirable, and useful, that the philosophy, the science, and the arts of the ancient world sink into comparative insignificance before them (11).

English, however, though superior to the classics, is still only a branch of instrumental knowledge; it is important, but mainly as a means to an end, as a help to the acquisition of positive knowledge, which is science,

> the native food of the intellect. I include in these sciences the knowledge of man's physical, moral, and intellectual nature, and the relations subsisting between them and external objects and beings (12).

Positive knowledge of science will provide that training which is true education. It will consist of knowledge of man's physical nature, of the material universe, and of the mental and spiritual world.

A full, useful life depends on good health, and therefore (Combe declares, earlier than Spencer) the human body should be studied carefully:

> One great use of knowledge is the preservation of health. This, although too much overlooked in many of the established systems of education, is of paramount importance. Life depends on it, and also the power of exercising with effect all the mental functions (13).

And since man is conditioned by his environment,

> the relations between the physical objects of external nature and the human frame should be explained, and the way in which the one affects the other pointed out . . . instruction in natural science connects our sympathies with real existences and living beings, furnishes our understandings with positive and precise ideas, and brings home to our minds an irresistible conviction of our being placed in the midst of agents, physical, animal, moral, and intellectual, to whose qualities we must adapt our conduct, if we desire to enjoy life (14).

Accordingly, the following branches of knowledge should be studied:

> (*a*) Preliminary, Instrumental subjects—reading and writing, arithmetic, algebra and geometry, as the means of acquiring, recording and communicating knowledge, and as a means of numeration and calculation;
>
> (*b*) Positive Knowledge, consisting of Geography, Natural History, Chemistry, Anatomy and Physiology, and Natural Philosophy (15).

The prime aim of these studies is to understand the natural laws which govern man and the universe. Upon the extent of our understanding of these laws will depend our happiness and usefulness in life (16). All has been planned by God. Our task is to comprehend this plan, to discover these laws, and to direct our lives according to them. Training in the branches of positive knowledge mentioned above will enable us to do this.

> The whole of external nature is an assemblage of objects exercising forces, physical, physiological or of causation, instituted by God, and bearing definite relations to the human mind and body; without studying, or acting in accordance with, their modes of action, we cannot take our stations in this world as its rational administrators, avoid evil, and command the enjoyment placed by Providence within the reach of our understanding (17).

Since this course of study will engage the mind actively on real objects of usefulness and will reveal the power and wonder of God in the universe it is bound, at the same time, to provide mental and spiritual training:

> This instruction is not intended to supersede moral and religious training, but to supplement it and to render it effective. Indeed, it is not so much the mere knowledge of the details of Chemistry, of Natural Philosophy, or of any other science, that I value, as the strengthening of the intellect, and the enlargement of the understanding, which follow from these studies, and which enable the educated man to carry out his moral, intellectual and religious convictions into action (18).

This is a serious and comprehensive programme, and rightly does Huxley acknowledge that Combe was one of those who began to advocate science in education (19). Indeed, neither Spencer nor Huxley himself is better entitled to the name of father of the scientific movement in English education than is George Combe. For nearly forty years, by means of public speech, article and book, Combe consistently and vigorously set forth the views touched on above. His arguments were usually clear, fair, logically arranged and aptly illustrated. He had judgment, the power to avoid irrelevancies, to pierce through a mass of detail, and to unearth and illuminate what is essential. He was subjected to much misrepresentation and abuse, yet he rarely lost his balance; his tone was normally moderate—by the standards of his time—and he hardly ever succumbed to the fierce temptation to make claims for the subjects he advocated as exaggerated as the claims made by his opponents for theirs. His attack on the classics was severe, but by no means unwarranted. He saw clearly that the prevailing emphasis on the philology and grammar of Latin and Greek was neither truly humanistic nor scientific; he stated his case against it soundly, he brought forward much supporting evidence, and he offered a reasonable alternative. Yet he did not go to the same lengths as Bentham or Spencer; he had no wish to demolish the classics, he was concerned mainly to remove them from their pre-eminent position and to substitute science; he allowed them a place, though inferior. Moreover, unlike most of those who sought to unseat the classics, he was quite clear about the substitute he favoured; his plan for the study of science is full, coherent and largely realisable.

His virtues were his own and positive; his failings were those common to almost all the advocates of science. He assumed that "reality" consisted only of what was palpable, of what could be expressed or measured objectively and accurately. In his enthusiastic investigations into physical fact he overlooked the consideration that the materials with which the humanities deal—human thoughts and feelings and moral values—are facts of existence as real as a lump of lead, and more significant, even though they rarely, if at all, permit of precise measurement and assessment. He did not adequately understand that literature is a means of giving precision, beauty, power and permanence to the many important but elusive emotions and ideas that inhabit the human mind and imagination.

Combe's partial subjection to the limitations of his time may also be noticed in his inability to conceive that science in schools could be much more than the learning by rote of a mass of fact and information. He did not generally foresee the method of practical work and experimentation in the laboratory by the pupils themselves, which is now recognised as one of the most valuable aspects of science teaching. The widespread provision of science laboratories in English grammar schools in the eighteen-forties was obviously not a practical proposition, and its advocacy would have appeared to many people wildly Utopian—or worse—but Combe should, perhaps, have envisaged, in addition to his short-term objectives, a few ideals of this kind—long-term aims. These would probably have attracted some of the more thoughtful educationists and might have checked those classicists who asserted that the study of science was merely the memorising of long lists of inert facts. Nevertheless, Combe knew a good deal about the practice of teaching, and his methods were in advance of those of his contemporaries and of Spencer. Jolly prints reports of several lessons conducted by Combe, and these show how, with a little simple apparatus and by a skilful use of the technique of question and answer, he was able to set pupils thinking and acquiring knowledge about such subjects as physiology and elementary economics (20).

But information about the working of our bodies does not always improve them—are doctors healthier, say, than farmers?—information about economics does not necessarily make one more sensible in the handling of money, nor does information about such processes as making railway lines or blowing glass help one in travelling or in drinking. Combe, however, like many of us to-day, tended to assume that this kind of information is of direct practical use to everybody, whereas, in fact, it is only of value to those few whose work is linked to it. Inert knowledge is rarely power; this he failed to see. In an industrial society knowledge of science—pure and applied—is essential for those who are to create, plan and direct. But it is not so vital for the majority of workers; they can do their jobs competently with the skill and knowledge acquired in their period of practical training in the industry. What they cannot do without—if they are to be more than mere productive units—is imaginative understanding of human beings; and in education this is supplied mainly by the humanities, though not by Latin and Greek as generally taught in Combe's day.

That Combe was not quite unaware of all this may perhaps be seen in his advocacy of the teaching of English; here he seems to be groping for a new humanistic study which would replace Latin and Greek and which would supplement science. He was the first since the seventeenth century persistently to urge the claims of English, and he stands as a forerunner of Ruskin, Huxley, Arnold and S. S. Laurie and of hundreds of professors and teachers of English to-day. But the indebtedness to Combe of following generations does not stop there. Notions similar to those found in Spencer, and, to a lesser extent, in Huxley and Arnold, appear in him, it has been suggested in this article, and here are one or two more links. J. A. Lauwerys says:

> In his youth, Spencer was very interested in phrenology . . . he wrote several articles for phrenological journals and invented an apparatus for making exact measurements of heads. It is tempting to look for some direct influence from Combe upon Spencer, but I have not been able to trace it. Spencer himself mentions only Spurzheim (21).

It is notoriously difficult to establish incontestably the direct influence of one writer upon another, and the difficulty is greater in the case of Spencer, who, far from being an enthusiastic and systematic reader, left few records of his reading, and even denied having knowledge of several authors, although they had set forth ideas similar to his own (22). Yet, bearing in mind that Combe as a disciple of Spurzheim was interested in phrenology, it is also difficult to master the temptation to believe that Spencer knew of Combe, particularly when we remember how alike were their views on the supremacy of science, and when we read passages such as the following

> Literature, Poetry, Painting, Sculpture, and all the useful and ornamental arts, find their principles in the constitution of the human faculties, and their relations to the objects of external nature, and cannot be thoroughly and scientifically understood until these are comprehended (23).
>
> No idea can be more preposterous than that human beings have no time to study and obey the natural laws. These laws, when neglected, punish so severely that the offender loses more time in undergoing his chastisement than would be requisite to obey them (24).
>
> It is a common practice with nurses, when a child falls and hurts itself, to beat the ground or the table against which it has struck. This is really cultivating the feeling of revenge. The method of proceeding dictated by the Natural Law is widely different. The nurse or parent should take pains to explain the cause of its falling, and present it with motives to take greater care in the future. The suffering would thus be turned to good account; it would become, what it was intended by Providence to be, *a lesson* to lead the child to circumspection, patience and reflection (25).
>
> Especially would I press upon your attention the importance of educating women, not merely in embroidery and music, but in a knowledge of things, especially in a knowledge of the Human Constitution. . . . For many years the lives of children depend almost exclusively on the care of the mother. Young women, therefore, should be taught not only how to regulate their own habits, so that they may preserve their health and vigour, but also how to treat children, both as physical and mental beings (26).

That Huxley had read Combe is certain. Even if it were not, one would hardly be rash in postulating a connexion between them on the evidence of the harmony of their educational views in general and of links in particular, such as the following which is a formulation of a notion later made famous by Huxley in his simile of "a game at chess" (27).

> [Combe] would represent the external world and the human constitution fitted to each other by the most exquisite wisdom, so as to produce health and enjoyment to man, provided he chose to conform to the laws which the Creator had established to regulate the physical and mental powers. . . . God has given to man faculties which enable him to observe, understand, and act according to these laws . . . life and health accompany normal and harmonious action . . . disease, pain, and premature death, are the consequences of disproportionate and abnormal action . . . the relations of cause and effect, in virtue of which life is preserved, and death ensues, were rendered by God cognisable by the human understanding, with the design of serving as guides to human conduct (28).

And an early expression of another equally famous notion—Arnold's division of the English into three classes, Populace, Philistines and Barbarians—may also be seen in Combe:

> The Lower Orders are extremely ignorant of natural knowledge; severe labour, with inadequate recompense, is entailed on them by their condition; and their circumstances render them incapable of that high degree of exercise of the moral and intellectual powers which is essential to the happiness of rational beings. In consequence, they are, to a great extent, the victims of animal propensities, and are visited by suffering in every form . . . their condition must affect the welfare of the whole community.
>
> A man of the Middle Ranks had never conceived that life had any higher aim than to acquire a fortune, marry, rear a family, live in a fine house, drink expensive wines, die, and go to heaven. There was no provision in this life for enjoyment from the higher faculties of his nature. This is the condition of mind in which almost all young men of the upper and middle classes of society enter into active life.
>
> In the higher ranks of life, family and ancestry are considered of great importance . . . in most of the countries of Europe, the founder of each great family was some feudal chieftain, of warlike and predatory habits. . . . On the principle that qualities of mind and body are transmitted by descent, it can be no honour to a mind which esteems its rational powers as the noblest, to derive its existence from such a source. The pride in such ancestry which still exists, shows latent barbarism in the hearts of our nobility (29).

Finally, in any survey of Combe's achievement, it is worth noting that his vigorous, intelligent and enlightened views were felt in a wide field of educational activity. Not only did he shrewdly assail the classics, present a coherent plan for the teaching of science, draw attention to the value of English as a grammar-school study, and prefigure the ideas of more famous men, but he laboured for a system of National Education, free and non-sectarian, and for secondary education for women, insisted on the need for thorough professional training for all teachers and a high status for them in the community, and inspired and aided such men as Wilderspin and Horace Mann.

Granted all this, why then did he not receive more acknowledgment in his own time, and why is he forgotten to-day? Partly, because as a leader of the "Secularists" he was subjected to much misrepresentation and obloquy, and, chiefly, because his qualities and his services have never been accurately and clearly known. They were never expressed in any durable form, during his life, never focused in a single, comprehensive treatise. His ideas were scattered in hundreds of speeches, reviews, articles, letters and private notes, shapes elusive and ephemeral. That some of them fell on good ground, however, and eventually brought forth fruit, is seen from their appearance in the work of later, more famous, educationists, and from their acceptance to-day. George Combe was one of those men whose work is usually essential before any advance can be made in human affairs; such men as he, expose flaws and indicate remedies, stir up a ferment of thought and discussion, create a propitious mental climate, and generally labour to prepare the ground for a harvest that is gathered after they have been taken away and mainly forgotten.

NOTES AND REFERENCES

1. Combe, G., *Education; Its Principles and Practice, by George Combe,* edited by W. Jolly (Macmillan, London, 1879), p. lxxv. This is a huge book; pp. i-lxxvi + 1-772, 8vo. Jolly was one of Her Majesty's Inspectors of Schools. He also edited *Ruskin on Education* (1907).
2. A profound concern for education is implicit in much that these three men wrote. In an outstanding piece of rhetorical prose Spencer asserts that training in science is essential for success in all the five leading kinds of human activity, and broadens the term "science" so much that it becomes, in effect, synonymous with "education"; see Spencer, H., *Herbert Spencer on Education*, edited by F. A. Cavenagh (Cambridge University Press, Cambridge, 1932), pp. 58-59. Huxley's was one of those few voices constantly raised "in favour of the doctrine that the masses should be educated because they are men and women with unlimited capacities of being, doing, and suffering, and that it is as true now, as ever it was, that the people perish for lack of knowledge"; see Huxley, T. H., *Science and Education* (Macmillan, London, 1893), p. 77. And Arnold laboured for "the elevation of a whole people through culture"; see Arnold, M., *Culture and Anarchy*, edited by J. Dover Wilson (Cambridge University Press, Cambridge, 1932), pp. 47-49.
3. Combe, op. cit., p. 6.
4. Combe quoting Paley, in Combe, op. cit., p. 11.
5. Combe, op. cit., p. 491.
6. There is a clear resemblance between these notions and those of Robert Lowe about the need for educating the people who were to have political power and also those of Arnold about the necessity for spreading culture through all classes to prevent anarchy.
7. Combe, op. cit., p. 37.
8. e.g. Spencer's attack on the classical curriculum for putting "words before things", Spencer, op. cit., pp. 66, 34, 4, 6-7, 43; and Huxley's assault on classics for deluding people "into taking words for knowledge", and his declaration that "Mother Nature is serenely obdurate to honeyed words; only those who understand the ways of things, and can silently and effectually handle them, get any good out of her" (Huxley, op. cit, pp. 63 and 406-8).
9. Combe, op. cit., p. 74.

10. " . . . every Englishman has, in his native tongue, an almost perfect instrument of literary expression; and in his own literature, models of every kind of literary excellence. If an Englishman cannot get literary culture out of his Bible, his Shakespeare, his Milton, neither, in my belief, will the profoundest study of Homer and Sophocles, Virgil and Horace, give it to him" (Huxley, op. cit., p. 154).
11. Combe. op. cit., p. 72.
12. Combe, op. cit., p. 45.
13. Combe, op. cit., pp. 40-41. This closely resembles what Spencer was to say later; see Spencer, op. cit., pp. 30-36.
14. Combe, op. cit., p. 41.
15. Combe, op. cit., pp. 51-52.
16. This is a point which both Spencer and Huxley were to make again later; Spencer observes "the invariable connexion of cause and effect . . . a system of rewards and punishments in the ordained constitution of things . . . laws to which we must submit that are both inexorable and beneficent" (Spencer, op. cit., p. 57); Huxley puts it in his well-known simile of "a game at chess", which is too long to quote here, see Huxley, op. cit., pp. 81-83.
17. Combe, op. cit., p. 40.
18. Combe, op. cit., p. 32.
19. Huxley, op. cit., p. 136.
20. Combe, op. cit., pp. 478-485.
21. Lauwerys, J. A., "Herbert Spencer and the Scientific Movement", in A. V. Judges, *Pioneers of English Education* (Faber and Faber, London, 1952), p. 168 n.
22. It is on record, though, that in *The British Quarterly Review* for April 1859 (No. LVIII, pp. 362-397) Spencer wrote a review of *A Treatise on the Physiological and Moral Management of Infancy* (Edinburgh, 1847), by Andrew Combe, George Combe's brother.
23. Combe, op. cit., p. 53. The links with Spencer are easily recognisable, see Spencer, op. cit., p. 44.
24. Combe, op. cit., pp. 55-56; cf. Spencer, op. cit., pp. 17-18.
25. Combe, op. cit., pp. 394-395; cf. Spencer, op. cit., p. 122. Both Combe and Spencer use the illustration of a child falling or hurting itself against a table.
26. Combe, op. cit., pp. 56-63; cf. Spencer, op. cit., passim.
27. Huxley, op. cit., pp. 81-83.
28. Combe, op. cit., pp. 51 and 134-141.
29. Combe, op. cit., pp. 174-177.

RESEARCH IN EDUCATION

A Review Article

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ALMOST imperceptibly we have entered upon a new era in educational research in these islands—the era of large-scale and long-term studies. As most university authorities have not yet woken up to the implications of the trend in terms of assistant personnel such as field workers, clerical assistants and computor operators, the lead in this research has passed to the research foundations and to those teams of researchers who are able to secure funds from outside the universities. The Scottish Council for Research in Education has for long led the van, commencing with its national mental survey of eleven-year-old pupils in 1932, continuing with the individual testing of a large representative sample in 1935-7, and with a 1947 survey of all children born in 1936. The present volumes are based on this last survey, the one considering its educational aspects, the other being a seven-year follow-up of a representative sample drawn from the survey, known as the six-day sample (1).

As with all such work it is far easier to look back and note deficiencies, especially in view of later developments in educational psychology and educational sociology, than to anticipate these deficiencies when the plan for the survey is being made. The Scottish Council for Research in Education is now well aware of the deficiencies and in an admirable chapter reveals some of its plans for future improvements. Two of the most important are the inclusion of standardised tests of attainment in the basic subjects, and the placing of a greater reliance on random sampling. Valuable as the survey is now it will be of much greater value in years to come, both by reason of these improvements and as a long-term statistical record of some aspects of the development of a part of the human race. It might well be said that the results are not, in their immediate consequence, commensurate with the effort involved; the long-term values, however, far outweigh this point. That the vision was great and the execution of it was merely good is a statement which implies no criticism; genius is by definition an extremely uncommon phenomenon, and he is indeed foolish who would bemoan its absence. In aiming at the stars the Scottish Council has missed a unit; it would have been surprising if it had been otherwise.

Another outstanding aspect of these large-scale researches is their sociological nature and implications. The most representative volumes are probably the Scottish Council's *Social Implications of the 1947 Scottish Mental Survey*, the classic *Early Leaving Report*, and the work of Floud, Halsey and Martin published in *Social Class and Educational Opportunity*. The principal lesson to be derived from them is that advance in educational attainment is probably being delayed more by sociological factors than by any others. Ironically enough the quickest and most effective way to remove these obstacles is by educational reform. To be more explicit it has been demonstrated conclusively that there is a strong relationship between the social class of parents and the academic record of their children in the secondary school. In this relationship it is likely that the most influential factor is the attitude of the parent towards the school, which in its turn is powerfully affected by the length of the parent's own education (2). Any increase in the average length of schooling will therefore be followed by a rise in the level of attainment of that generation's children.

Those who are especially interested in the influence of social class factors on the attainment of grammar school pupils will find additional evidence in the work of Campbell (3) and of Fraser (4). In "Secondary School Selection", edited by Vernon (5), it is even stated that among children at the selection borderline (by Moray House tests) an index of social class provides the best single predictor of future success. It has become clear that pupils cannot be satisfactorily allocated to grammar schools unless social class is taken into account. It is also certain that public opinion would not tolerate such a procedure. The stalemate can only be resolved either by abandoning allocation and placing all pupils in comprehensive schools or by providing a secondary school system where transfer is easy and customary. The new knowledge is already being put into practice by many local education authorities; the others will inevitably follow.

Underlying much of this research are fundamental questions such as the relative influence of environment and heredity upon intelligence. This is often confused with the influence of environment and heredity upon intelligence test scores. But the score in a verbal group test of intelligence (or academic aptitude) depends to an appreciable extent upon the vocabulary of the testee as well as upon his "g"; if a testee does not know the words he cannot evoke the concepts they connate, and is unable to show the intelligence which may well be there. This intelligence could be keener, within a narrow vocabulary range, than that of a pupil who had a higher intelligence test score on a test which had a more normal vocabulary range.

As the extent of a person's vocabulary depends appreciably upon his environment, so his intelligence test score (but not necessarily the sharpness of his reasoning ability) will vary slightly according to his environment. Therefore the reason for the higher intelligence test score of the first-born, found in several of these studies, may be his environment of adults, as opposed to his siblings' environment of children; anyone who has had much to do with only children will know how precocious they are, particularly in the breadth of their vocabulary. A similar factor may explain the greater intelligence test score of Scottish children in 1947 compared with 1932. Pupils' vocabulary would tend to be increased by the better social environment, by better educated parents and better educational facilities, etc. We do not know whether the keenness of a pupil's reasoning ability can be increased by these means, but his increased vocabulary would enable him to use his intelligence in a wider field and thereby gain a somewhat increased test score. In view of these factors, combined with the actual increase in the average score of Scottish children, found in the 1947 survey, we still do not know whether the differential birth rate among the social classes is producing a slow decline in the keenness of pupils' reasoning ability. The researchers demonstrate that the increase in score is probably not due to a practice effect. Another factor which may hide a decline is the decrease in family size, because of the inverse relationship between family size and intelligence test score; once again the increase in score due to a decrease in family size may be caused by an increase in vocabulary, enabling pupils to apply their intelligence on a wider front, rather than to an increase in the keenness of their reasoning ability. It seems that we are now ready to go beyond the concepts of Intelligence A (innate) and Intelligence B, and to consider whether we ought not to introduce two new concepts—width of intelligence as limited by a person's range of concepts, and depth of intelligence, i.e. keenness of reasoning ability. It is possible that a knowledge of the width of a person's intelligence may be particularly relevant to some problems of educational and vocational guidance, and its depth or keenness to others. For the latter concept it may be that power would be better term.

REFERENCES

1. Scottish Council for Research in Education, *Educational and Other Aspects of the 1947 Scottish Mental Survey* (London, 1958) and J. S. Macpherson, *Eleven Year Olds Grow Up*, Scottish Council for Research in Education (London, 1958).
2. Cf. a small-scale but useful unpublished M.A. thesis by Stephen Griffiths, *A Comparison of Improvers and Deteriorators in a grammar school in South Wales* (University College of Swansea).
3. Campbell, W. J., "The influence of home environment on the Educational Progress of Selective Secondary School Children", *Br. J. Ed. Psycho.*, XXII (1952), pp. 89-100.
4. Fraser, E., *Home Environment and the School* (1959).
5. Vernon, P. E. (ed.), *Secondary School Education* (London, 1957).

BOOK NOTICES

JOHN and JOAN LEVITT, *The Spell of Words* (Darwen Findlayson, London, 1959, 15s.).

M. L. HOURD and G. E. COOPER, *Coming Into Their Own* (Heinemann, London, 1959, 21s.).

THE reviewer once considered whether the publication of a book entitled *My Hundred Best Précis*, or *Collected Comprehensions 1935-50*, might focus attention on the highly artificial and abstract nature of much English Language study to-day. Some teachers, whilst recognising the shortcomings of the dry-as-dust diet which usually goes under that name, and being well aware that true progress in writing and speaking comes largely from writing and speaking, in situations as realistic as possible, have nevertheless felt that a study, rightly conceived, of the mother tongue, would be of considerable value in other ways to their pupils. They will seize eagerly on Mr and Mrs Levitt's book.

The Spell of Words is an introduction to the study of language looking "outwards to (its) historical and social function . . . rather than inwards to its form and grammar" and presupposes no previous acquaintance with the subject. Its chapter headings are immediately informative (for instance, "Languages exchange words", "Words change their sounds", "English comes to England") and this unpretentious clarity is maintained throughout the text, with the help of diagrams where necessary. The origins, changes, and exchanges of language are discussed: there are sections on such topics as personal and place names, slang (including "private" slang) and standard English, the American language, and the types of meaning which words may have. In a fascinating account of euphemism that term is wittily defined as "The process of giving a dog a good name in the hope that he won't bite". The scholarship of the authors is unquestionable, but they wear it lightly: points are *explained*, and illustrated with examples from common experience.

Every training college, grammar (and many a secondary modern) school pupil would profit from the book: its empirical approach (it is concerned with language as it is, *not* as the prescriptive grammarian thinks it ought to be) will appeal to the sixth form scientist, enjoined to "literacy" by Crowther. One would have liked to see something on the relative prestige of different dialects, or on the changes in present day vocabulary brought about by (say) science; but this is not so much a criticism of as a tribute to the book, which makes one anxious to learn more. And one is given an incentive to do so by the bibliography and particularly by the questions included at the end which refer not only to the chapters one has read, but also outwards towards a further knowledge of the subject. Significantly these are not called "Questions" but "Entertainments".

Coming Into Their Own is a fascinating book. It is an anthology of verse written by children of 10 or thereabouts with an introduction and commentaries. In one place Miss Hourd attempts to forestall the criticism "These children take so freely from the poems they have read, how can it be said that they are even in process of coming into their own?" But no poet ever starts from scratch, and it would be a very ingenuous critic who could raise such a question about the verses printed here.

What is in fact remarkable about them is their freshness and directness. The reader is brought directly into contact with the innocence and guilt, hopes and fears of childhood:

I felt fear
Dig me like a little spear.

We have an orchard where rich apples grow;
It belonged to my mother long long ago.

The theme "witches" which results in conventional "broomstick" associations in No. 51 produces (No. 15) a poem which is fearfully personalised:

At the witches' meeting, witches are.
They come from near and far.
They are horrible and hard;
They would kill you in your own backyard.

There is nothing out of the ordinary about the children who have written these verses, nor about their school except the wisdom of its teachers who provided the conditions where poetry could come "as naturally as the leaves on the tree" in Keats's phrase. The children had all kinds of poetry read to them (but only read, not "taught") so that they could take or leave what they wanted to. And on each occasion they were given an opportunity for their own creative writing. At first they produced conventional ideas in conventional diction (wittily dubbed "twinkle" verse in the book) but after a time cleared their systems of these, and turned to the exploration of the inner and outer worlds of their experience. Usually they chose their own subjects, occasionally titles (only) were offered by the teacher; no specific guidance was given on treatment or revision. Such freedom is essential with children of this age, and the effects of Miss Hourd's experimentally mischievous suggestions to Veronica on her poem "The Churchyard" (both versions given) are additional evidence of this.

Miss Hourd writes: "Perhaps the most important asset for a teacher engaged upon creative work of any kind is the capacity to wait upon the moment." She adds: "It is of course a gift essential to the psycho-analyst." It is this last analogy that is disturbing for one finds in the book an attempt to interpret the inner life of certain children from a handful of their poems, an attempt which is pervasive despite the hesitancies with which it is offered. The teacher should be aware in general terms of the immense value to the child of the sincere expression of thought and feeling ("strengthening a sense of personal identity") but further excursion into the field of the analyst is to be deprecated. In general the commentaries of both editors on the poems are sensitive and intelligent, particularly when they concern the approach to verse writing, the nature of the creative process, the conditions for its success, and the relationship of the new poem to poems on which it may have drawn. Miss Hourd and Miss Cooper are to be congratulated on an excellent book, which will be indispensible for anyone concerned with bringing children into their own through creative writing.

ANDREW M. WILKINSON

MABEL DAVIES, *Physical Education Games and Athletics for Training Colleges* (Allen and Unwin, London 1959, 18s.)

DURING the present century fundamental changes have taken place in physical education and these largely reflect the developments in educational theory and practice. The stress laid on the individual child and the education of the "whole man" are some of the considerations which have led to the wide adoption of Laban's principles as a basis for "movement training". The development of this approach has involved controversy within the profession and many teachers have felt misgivings in discarding the old ideas and standards for a complete acceptance of new concepts. This has resulted in a certain amount of bewilderment and loss of confidence, which has been aggravated by the fact that, apart from the Ministry publications of 1852 and 1952, there has been little authoritative statement in print.

Recently there have been indications of a more stable situation in which conflicting ideas have become reconciled in a general acceptance of the value of "movement training" in physical education. It is a healthy sign that there are still wide differences of opinion as to how far this approach can be used as a basis for the whole of physical education. While there are those who made extensive claims for its potential value in skill training, others advocate the need for a distinction to be drawn between this approach to movement and the learning of specific skills.

Miss Davies' publication will be welcomed by many in the profession as a courageous attempt to provide a comprehensive and balanced view of the present trends in physical education. This is the ninth edition of her well known book *P.T. Games and Athletics* but it has been revised and brought into line with modern ideas and methods. Unfortunately the author has selected a new title which in itself presents an ambiguity but this is perhaps indicative of the difficulties involved in attempting to graft the new on to the old.

The first part of the book is concerned with movement training. The author sets out not only to elucidate aims and content but also to suggest teaching techniques. Since the presentation of material is a point on which many students and young teachers need guidance this detailed analysis of method may prove of considerable help, particularly to the non-specialist. It is generally agreed that the teacher should plan her own lessons in relation to the needs of her groups but for the general subjects teacher this selection of content can present a problem. Miss Davies provides a compromise as she supplies a wealth of suggested material and at the same time stresses that "it is not supposed that the practical examples will be other than indications of possible and differing lines of development".

One of the difficulties experienced by students of physical education is to link theory with practice and Miss Davies attempts to do this with a generous sprinkling of educational theory. This is particularly evident in her chapters on infant work where the author's numerous practical suggestions are easily related to play interests and the aims which she puts forward. At the junior stage however, with the increase of skill and strength and when play has become realistic rather than imitative, it is necessary to have a more careful examination of aims and their application in practice. If the child is to feel the satisfaction of increasing skill, the limitations must be such that they provide a realistic opportunity for the development of that skill. In ball handling, for example, the teacher should also be concerned with such mechanical factors as rebound. If the child constantly uses the ball as an aid to developing movement quality, as the author suggests, there is a possibility that this may hinder the acquisition of the refined movement required in many skills. Miss Davies discusses the relative values of "process" and "product" and places considerable emphasis on the former. The dangers of this become apparent if the process is not wholly related to the product and in this context the chapter on secondary school gymnastics is likely to provoke discussion.

There is a great deal of useful material in Part II which deals mainly with games and athletics. The author touches on a number of important points of principle such as the transfer of training, professionalism and the place of competition. While these are arguable points, the reader is encouraged to think of the responsibilities involved in the training of games and athletics. Sound advice is given on planning and organisation in schools and this is clarified by the addition of helpful diagrams. For those who require a more detailed study of these subjects other books are available and for this reason the student of dance and swimming will be well advised to refer to books of a more specialised nature. This is a comprehensive publication and with the growing tendencies towards more specialism within P.E. it is not likely to meet the demands of the specialist. It will however supply a long felt need in training colleges for a source of reference and is sufficiently provocative to be used as a basis for the discussion of principles. Miss Davies is to be congratulated on bringing ou this revised edition when there is a singular reluctance to clarify aims and methods in print.

C. D. Roberts

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